Space and astronomy: Space Science and Engineering Center (SSEC) (1964 - 2001). 1964/2001

[Madison, Wisconsin]: [s.n.], 1964/2001

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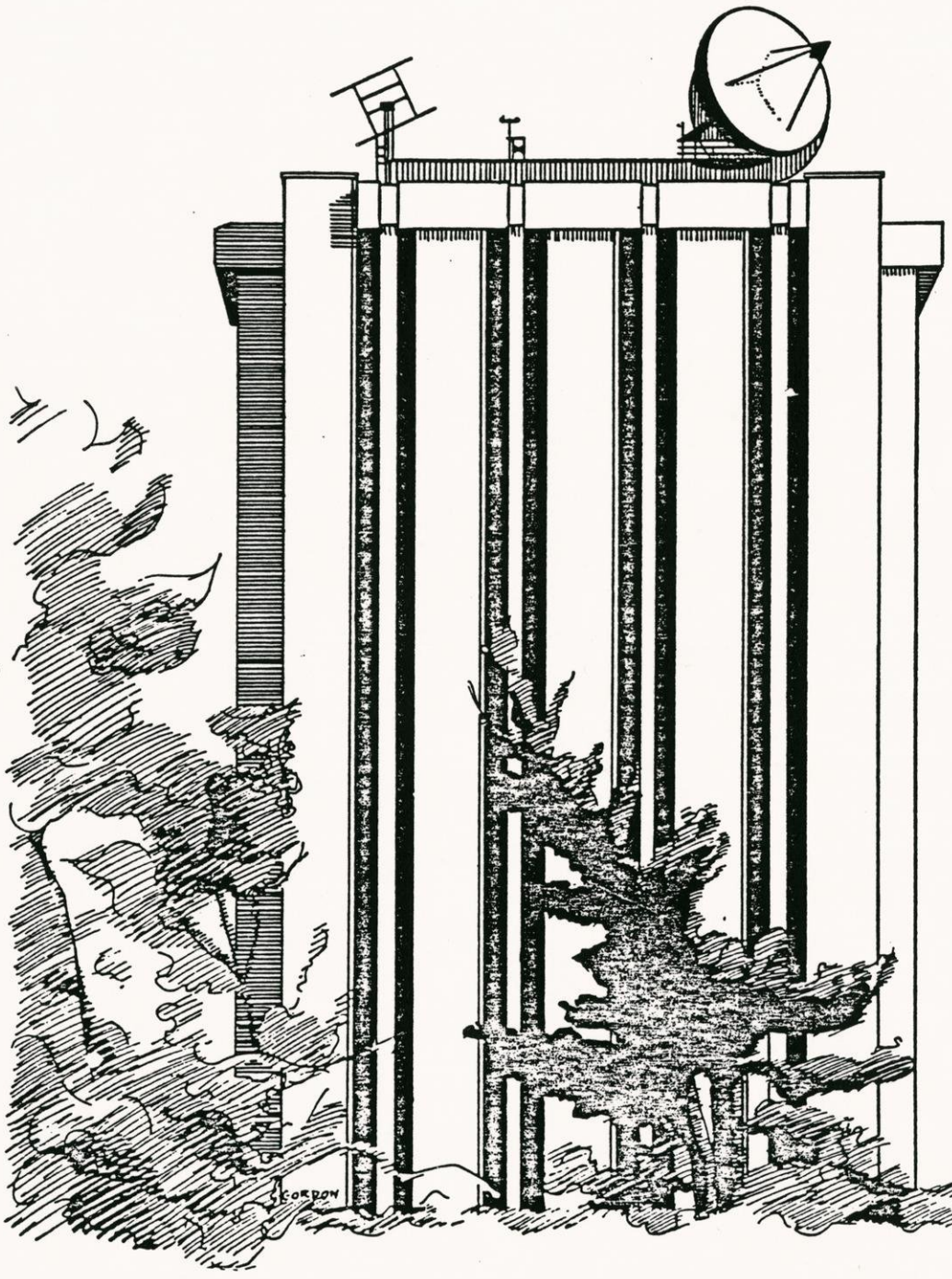
1983

University of Wisconsin-Madison



Space Science and Engineering Center

PRELIMINARY

1983

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Space Science and Engineering Center
University of Wisconsin - Madison
1225 West Dayton Street
Madison, WI 53706

PREFACE

The purpose of this report is to introduce you to the Space Science and Engineering Center at the University of Wisconsin-Madison.

The report contains information about the center's mission, some of its research and development programs, its facilities, and its administration and organization.

It is important to realize that the Center serves as a resource to the university community in addition to the pursuit of its own research and development goals.

INTRODUCTION

The Space Science and Engineering Center at the University of Wisconsin-Madison was founded in 1966 by Professors Robert J. Parent and Verner E. Suomi, its present Director. Their earlier work, the development of the spin-scan cloud camera used on the Applications Technology Satellite (ATS) and later day Geosynchronous Operational Environmental Satellites (GOES) set the tenor for the Center's work: to conduct multidisciplinary research programs in the areas of atmospheric and space science as well as space flight hardware development.

As a research and development center under the authority of the Graduate School, SSEC is distinguished from the educational side of the university in that the center does not grant degrees nor does it have an education program or curriculum. Its facilities and staff are available as a resource to all principal investigators in the university, though the majority of the center's research programs are initiated by center scientists. The major portion of the center's financial support comes from federal contracts and grants.

ASSOCIATED ORGANIZATIONS

DEPARTMENT OF METEOROLOGY

Informal scientific and educational cooperation exists between SSEC and the Department of Meteorology. Scientists and professors participate in jointly conducted research programs and SSEC supports the research activities of approximately 25 meteorology graduate students yearly.

NATIONAL EARTH SATELLITE DATA AND INFORMATION SERVICES (NESDIS)-DEVELOPMENT LABORATORY (DL)

In 1977 the National Oceanic and Atmospheric Administration (NOAA) established the NESDIS-DL at the University of Wisconsin-Madison under the direction of Dr. William L. Smith. It functions as a government laboratory affiliated with SSEC, and its primary research thrust is satellite applications with special emphasis on atmospheric sounding and the study of mesoscale weather.

COOPERATIVE INSTITUTE FOR METEOROLOGICAL SATELLITE STUDIES (CIMSS)

CIMSS was established in 1980 by agreement between the University of Wisconsin-Madison and NOAA. Its research focus is on the applications of meteorological satellite data. The Institute is not a funding entity for research programs; however, it does sponsor visiting scientists for cooperative research and to increase the exchange of information between Institute scientists and scientists worldwide. CIMSS is administered by SSEC and is directed by Professor Verner E. Suomi. Membership in the Institute includes primarily researchers from the Department of Meteorology and SSEC, but is open to all scientists sharing its goals and interests.

RESEARCH AND DEVELOPMENT WITHIN THE CENTER

The mission of SSEC is to conduct multidisciplinary research in the atmospheric and space sciences. There are four major areas of activity in SSEC: Atmospheric Science, Planetary Science, Interactive Computing and Data Access, and Spaceflight Hardware. These are not formal divisions within the Center, since they overlap and interact as needed, but they do provide categories to describe our major areas of interest.

ATMOSPHERIC SCIENCE

Why are we stuck with weather forecasts which are (at best) only good for up to three days? The answer lies in the character of the atmosphere: it is a global system, the motion of which is ceaseless and often turbulent.

To extend the range of weather forecasts beyond three days, and to develop a better understanding of our complex atmosphere and its interactions, SSEC scientists have participated in projects ranging from active involvement in international studies and field experiments to individual research entirely in-house. A few examples of our atmospheric research follow.

International Experiments

Scientists at SSEC have participated in a series of international studies of the tropics, each aimed at providing basic understanding of the atmosphere through more realistic numerical models of it. Chronologically, these studies are: the Global Atmospheric research Program (GARP), the Atlantic Tropical Experiment (GATE), the First GARP Global Experiment (FGGE), and three experiments on the earth's monsoon circulation: West African Monsoon experiment (WAMEX), the great Asian monsoon experiment MONEX winter phase, and MONEX summer phase.

FGGE

FGGE, the largest meteorological experiment ever undertaken, involved the cooperation of more than 140 countries to put together a complete picture of the earth's atmosphere for one year -- 1979.

One of SSEC's roles in FGGE consisted of measuring the tropic winds and winds over the Indian Ocean from satellite images. Over one million measurements were made. These vector sets, mostly over the ocean, were needed to fill in gaps in the global weather net and could only be obtained from satellite images.

Satellite data from the FGGE year is archived at SSEC. This includes data from United States' satellites: GOES-East, GOES-West, and GOES Indian Ocean; from Japan's Geosynchronous Meteorological Satellite; and from the European Space Agency's Meteosat.

MONEX Studies - The Asian Monsoon Experiment

SSEC scientists are estimating daily rainfall over the Arabian Sea for part of the summer phase of the Monsoon Experiment. Their purpose is first to trace the progress of the monsoon as it developed and advanced into India, and second, through budgets of moisture in the atmosphere, to tell from where the rain came. The estimates are based on hourly imagery from a geostationary satellite over the Indian Ocean.

It is hypothesized that for any point of a single image, rain rate can be estimated as one of four mutually exclusive cases: none, light, moderate, and heavy. The sum of the frequencies of each case over twenty-four hours determines the daily rainfall estimated for that point. The image is covered by a grid of points, whose spacing is determined by the scales of the main rain systems. This approach retains the advantages of high time resolution in the recognition of rain clouds but does not require that individual rain clouds be followed in time. In that sense, it combines the strengths of the cloud life-history and the cloud classification (indexing) classes of methods.

Diagnostic and Numerical Studies of Atmospheric Circulation

Several groups of scientists within SSEC engage in diagnostic and numerical studies of atmospheric circulation for planetary, secondary, and mesoscale circulations. Using research data from FGGE, SESAME, and other major experiments, scientists are studying the distribution of energy balance, processes of momentum exchange, and critical weather events for these various scales of atmospheric motion in order to improve basic understanding and prediction of these phenomena. Specific studies include the determination of the global distribution of heating, intercomparison of observed and numerically simulated cyclone and mesoscale circulations, and diagnostics and numerical simulation of the mesoscale severe weather.

Oceanography

Research and exploration now reveal interesting and important phenomena which couple the oceans and atmosphere into a global climate system. Thus, Center scientists are studying the oceans because of their influence on weather and climate.

SSEC scientists are contributing to the design of an instrument to be used on the latest generation of oceanographic satellites. They are developing methods to improve the accuracy of the instrument's measurements. The scatterometer, a special purpose radar sensor, measures the speed and direction of winds over the oceans. It is planned for use on a satellite that will monitor the oceans, collecting data to be used in civil and military weather forecast systems.

Using cloud motion measurements made during the Global Weather Experiment, scientists are also studying wind stress on the oceans. As a special part of these experiments, cloud winds were measured over the Indian Ocean for the summer monsoon in 1979. A statistical model of the relationship of wind at cloud level and at the ocean's surface was developed based on over 4000 cases where ships and clouds could be used to measure winds at the same location simultaneously. Since ships are not uniformly distributed over the oceans at a particular observation time, and since there are always cloud free areas, it was found that a more complete picture of the winds resulted from using both. The wind measurements taken from clouds were incorporated into an atlas published by SSEC with funding from the National Science Foundation.

In addition to the above cited research, SSEC has sponsored oceanographic workshops which have attracted scientists from around the world.

VAS (Visible Infrared Spin Scan Radiometer Atmospheric Sounder)

The VAS instrument was conceived at SSEC to provide the capability to probe and image the earth's atmosphere in the visible and twelve infrared spectral bands from aboard a geosynchronous spacecraft. The combined data from these spectral bands yield vertical profiles of temperature and humidity from the surface of the earth to the top of the atmosphere. It is possible to probe the same region of the atmosphere repeatedly to determine the rate of change of temperature and moisture. This information may help to explain instabilities and energy exchange patterns that cause short-lived weather phenomena such as thunderstorms, tornadoes, and dust storms. SSEC is a key participant in the NOAA-NESDIS-SSEC team in developing the techniques and data processing system to exploit the VAS capability, and is in fact operationally receiving and processing VAS data for evaluation and use.

PLANETARY SCIENCE

What is the weather like on the planets (strictly, bodies with atmospheres, including planetary satellites such as Io and Titan)? How are the weather and climate on each planet different from ours? Different planets present different physical situations and thus determining the atmospheric conditions on these planets is akin to performing a controlled experiment in a laboratory. What can we understand about the weather and climate on earth from what we learn about conditions on other planets? These are some of the central questions being addressed at SSEC. The tools used are similar to those being used on earth although the data is relatively sparse and comes mostly from space missions.

Venus

Research on Venus is concentrated in two major areas: (1) global atmospheric circulation, and (2) radiation budget through measurements of the net radiation flux in the Venus atmosphere. Global atmospheric circulation on Venus is being studied via analysis of images obtained from Mariner 10 and Pioneer Venus Orbiter missions. Prominent results from this analysis include the detection of the organization of the large scale circulation into huge hemispheric vortices in the southern and northern hemispheres of Venus, centered about the respective poles, and the existence of mid-latitude jets in the zonal winds at the cloud top level.

The radiative studies of Venus are centered around measurement and analysis of the net radiation flux, i.e., the difference of the upward directed (long wave radiation emitted by lower layers of the atmosphere and surface) and the downward directed (incoming solar radiation and the downward direction radiation emitted by the atmosphere) radiation. This difference determines the amount of local heating taking place within the atmosphere. The Pioneer Multiprobe mission carried three Net Flux Radiometers (SNFR) on each of the three small probes. These instruments, designed and built at SSEC, measured the net radiation fluxes in the Venus atmosphere as the probes descended to the surface. Interpretation of these measurements is crucial in understanding the radiative balance of Venus as well as the effects of varying abundances of substances like water vapor.

Saturn

Weather on Saturn is being studied at SSEC from the images returned by the two Voyager spacecrafts. Results obtained so far include detection of a Rossby-like planetary waves in the northern hemisphere, storm systems, and the large scale atmospheric circulation.

The profile of zonal wind shows a broad, high speed jet centered at the equator with wind speeds exceeding 450 m/s. Meridional motions have been found to be very small.

Techniques have also been developed for estimating the figure of Saturn from the images in different colors as the apparent size of Saturn depends on the wavelength of observation.

Titan

Voyager images of Titan do not show a wealth of detail when compared with Jupiter or even Saturn. However, they do show a very prominent feature and that is a very bright southern hemisphere. Investigation of the causes of this brightness asymmetry indicate that a seasonal lag in the thick atmosphere of Titan may be responsible along with influence of the solar cycle. When the scattering geometry effects are removed, these images also reveal the presence of a dark collar cloud at high latitudes and a thin veil of haze in the mid-latitudes. Continued monitoring of Titan's brightness will help distinguish between the two mechanisms proposed for explaining the brightness asymmetry.

INTERACTIVE COMPUTATION AND DATA ACCESS

A powerful facility for meteorological analysis called McIDAS (Man-computer Interactive Data Access System) was developed at the Center. Since it's early inception in the 1970's, McIDAS has evolved into a sophisticated tool which combines data access and processing (provided by the computer) with pattern recognition, reasoning ability, and subjective judgement (provided by the user).

McIDAS can generate multicolor composites of conventional and satellite weather data, radar, and forecast data in a wide variety of two- and three-dimensional displays as well as time lapse movies of these analyses. In addition, GOES data from the extensive SSEC archive can be ingested on an off-line basis without interfering with the real time data ingestion. Also, SSEC's large planetary data archive comprised of Mariner 10, Voyager, and Pioneer Venus spacecraft imagery data is available to system users.

More a software system than a hardware system, McIDAS in its early stages was designed for handling large amounts of meteorological imagery and other atmospheric data in a convenient manner. As the system evolved, other applications such as planetary image data processing were also done using McIDAS capabilities. As a result, a vast resource of image processing and meteorological application programs and subroutines has been created.

The hardware configuration of McIDAS is shown in Figure 1. Basically, it consists of an IBM 4341 Group 2 computer plus associated peripherals. A number of video terminals are connected to this computer either directly through a high speed local area network which interfaces directly to a computer channel, or as remote terminals connected through an IBM 3705 communications controller.

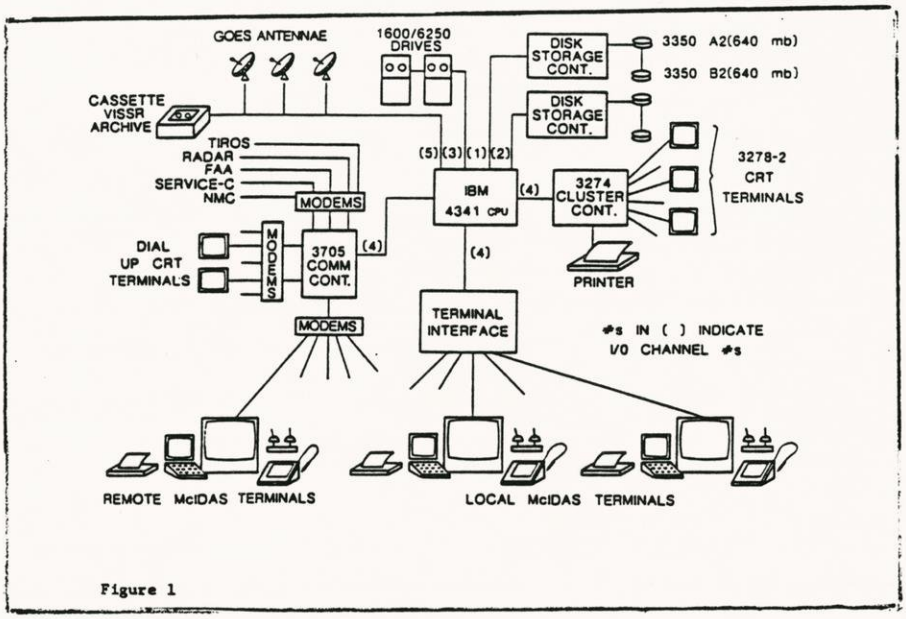


Figure 1

A McIDAS video terminal is a coordinated work-station that consists of a keyboard, an alphanumeric Cathode Ray Tube (CRT) terminal for displaying the computer-user communications, a high resolution RGB color monitor, a pair of joy-sticks, a printer for hard copy text output and a data tablet. Such a terminal allows a user direct interaction with the computer.

Data available to McIDAS include the GOES visible and infrared (Visible Infrared Spin Scan Radiometer, or VISSR) images as well as the VISSR Atmospheric Sounder (VAS) multi-spectral imagery and sounding data through three antennae located on the top of the building housing SSEC. TIROS polar orbiting satellite imagery and sounding data can be ingested via dedicated communications lines from remote receiving stations and from antennae located adjacent to the GOES antennae. Meteorological data for North America such as FAA Service A hourly weather data from the airports, the Service C radiosonde observations, weather radar pictures, pilot reports, NMC forecast products, etc., are ingested via dedicated and dial-up communications lines as well. The McIDAS CPU also communicates with other computers via dedicated communications lines.

The McIDAS hardware and software are used by the the National Aeronautics and Space Administration (NASA), the National Oceanic and Atmospheric Administration (NOAA), the U.S. Air Force and Navy, and more than a dozen universities and private meteorologists in the United States, Canada, West Germany and Australia. A McIDAS-like hardware/software system has been installed by SSEC at the Severe Storm Forecast Center in Kansas City and the National Hurricane Center in Miami to assist with weather analysis and severe storm prediction.

SPACEFLIGHT HARDWARE

SSEC provides investigators with the administrative and technical support required to produce spaceflight hardware on campus without the need to contract an outside aerospace company. SSEC has been building instruments for spacecraft since its founding and has spaceflight experience going back to the early 60's and extending to the present and future Shuttle era. Some of the projects with which the Center has been involved include the following:

OSO-8 Soft X-Ray Experiment

This 100 pound instrument contained six proportional counters, two of which had thin windows and a gas supply for low energy (100 electron volts) sensitivity. The counters contained coaxial anodes which were developed (and patented) especially to maximize the collection area while providing efficient vetoing. OSO-8 was launched in June 1978 and operated for over three years until turned off for budget reasons. The instrument was designed for a nominal one year mission but operated for the life of the spacecraft.

Pioneer-Venus Net Flux Radiometer Experiment

This instrument was placed on each of the three small probes of the Pioneer Venus mission to measure the net radiative flux as a function of altitude in order to better understand the atmospheric dynamics of Venus. The major challenge was to make an instrument that would work in the harsh (1500 psi, 1000 degrees F, sulfuric acid) environment of Venus. The mission was successfully completed in 1978 and data is still being analyzed.

Space Telescope High Speed Photometer

The University of Wisconsin-Madison was selected in 1977 to design, build, test, and deliver a High Speed Photometer for the Space Telescope which is expected to be launched by the space shuttle in 1986. The HSP carries five detectors, four image dissector tubes and one photomultipler. The instrument is about the size of a telephone booth (7'x3'x3') and weighs 570 pounds. The instrument is designed to make precise measurements of short time duration (as short as ten microseconds) variations in the brightness of stars.

Flat Plate Radiometer

SSEC designed and built a radiometer for the TIROS series of weather satellites, one of which can now be seen in the Smithsonian Air and Space Museum in Washington, DC.

Diffuse X-Ray Spectrometer

SSEC has completed a phase one definition of a Bragg crystal x-ray spectrometer which is planned for a shuttle mission in 1987. The spectrometer will provide high resolution information at low energy levels.

CENTER FACILITIES

The SSEC building is easily identified on the University of Wisconsin-Madison campus by the two 7.3 meter and one 5.0 meter diameter antenna reflectors mounted on the roof which receive earth images continuously from two GOES satellite and the VAS data from a third satellite.

Signals from the antennae are routed to a unique multiprocessor data facility which is based on the McIDAS development program previously described. Under the sponsorship of NOAA, SSEC records all of the images from the two GOES satellites and the VAS data. The equipment capable of recording this enormous data volume (2.8×10^{11} bits per day) at low cost was developed and built by SSEC. Through the NESDIS of NOAA, SSEC serves as the national archive of GOES data.

A super-clean (class 10,000) room is maintained and semi-clean electronics assembly rooms are interconnected through dust locks. A separate computer room allows computerized testing and exercising of space flight hardware while in a clean room environment. These facilities are essential for the assembly of spacecraft hardware. In addition, SSEC operates a complete quality assurance and test facility staffed by a full-time engineer trained and qualified in NASA quality assurance procedures.

The SSEC is well equipped to design, fabricate, and test state-of-the-art electronics equipment with thermal-vacuum test chambers, an equipment vibration test facility, and wood, sheet metal, and machine shops.

An atmospheric sciences research library contains an extensive collection of meteorological satellite pictures. The images in this library date from the first TIROS and provide users the longest time history of satellite images available anywhere.

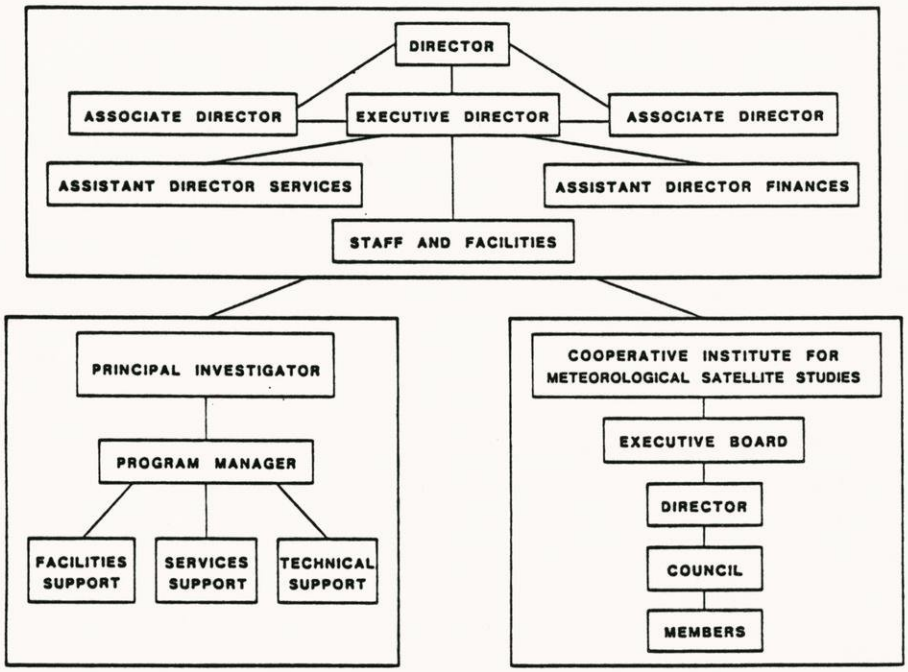
CENTER ADMINISTRATION

The Center has a matrix organizational structure. On the larger scale it is administered by a team of managers (Figure 2) in direct support of the Center's Director. On the secondary scale, and functioning within the framework of the larger scale, is program management (Figure 2) which is direct support of the Principal Investigator. Because the Center may have as many as 35 separate programs in house at one time, it is necessary to overlay the large scale administration on the program management to assure that all programs have access to needed facilities and have adequate staffing.

In addition to the Center's organizational structure is the residence of the Cooperative Institute for Meteorological Satellite Studies (CIMSS) (Figure 2) in the Center. While CIMSS has its own administrative structure, it does rely upon the Center for administrative support in any activities which must be coordinated with the University of Wisconsin-Madison or which are joint activities between SSEC and CIMSS.

As with any organization, SSEC's most important resource is its people. The Center has in support of its multidisciplinary research and development three general areas of expertise: meteorological science, computer science and electrical and mechanical engineering. Figure 3 illustrates the percentage distribution of these areas as well as other support in the Center. The staff composition and size over the last ten years shows the Center in a growth cycle which we believe has leveled off. Figure 4 illustrates this ten year period in terms of budgeted staff, foreign and domestic visitors (one year duration or longer), and graduate students supported.

On the financial side of the Center's administration, the fiscal year expenditures over the last six fiscal years are shown in total dollars in Figure 5. The Center is 98 percent funded by extramural support. That process is detailed in Figure 6 and the funding sources are shown in Figure 7 with a percentage distribution for FY 1982-83.



SSEC ORGANIZATION AND OPERATION CHART

FIGURE 2

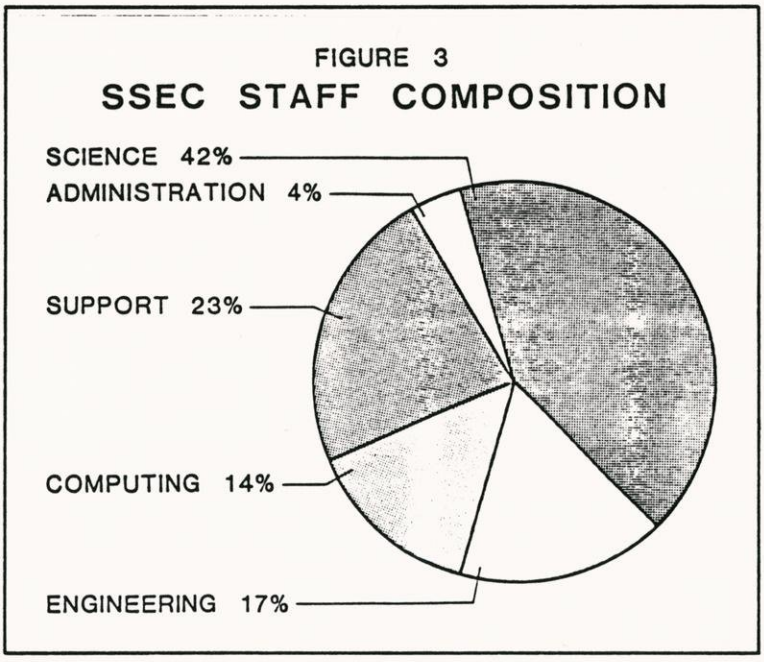


FIGURE 4
STAFF COMPOSITION
JANUARY 1974 - 1983

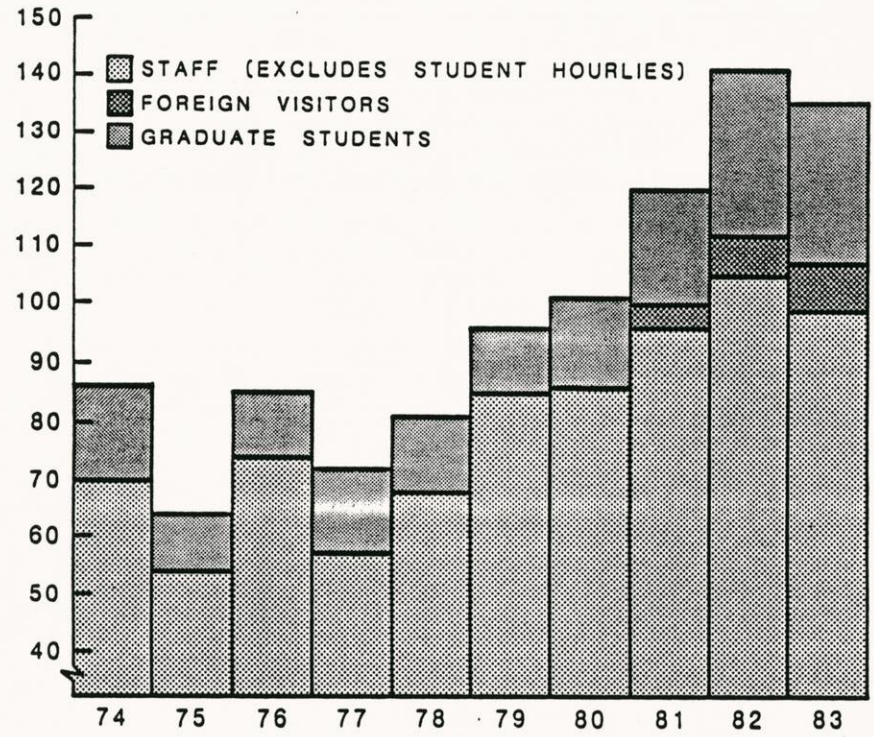


FIGURE 5
EXPENDITURES BY FISCAL YEAR

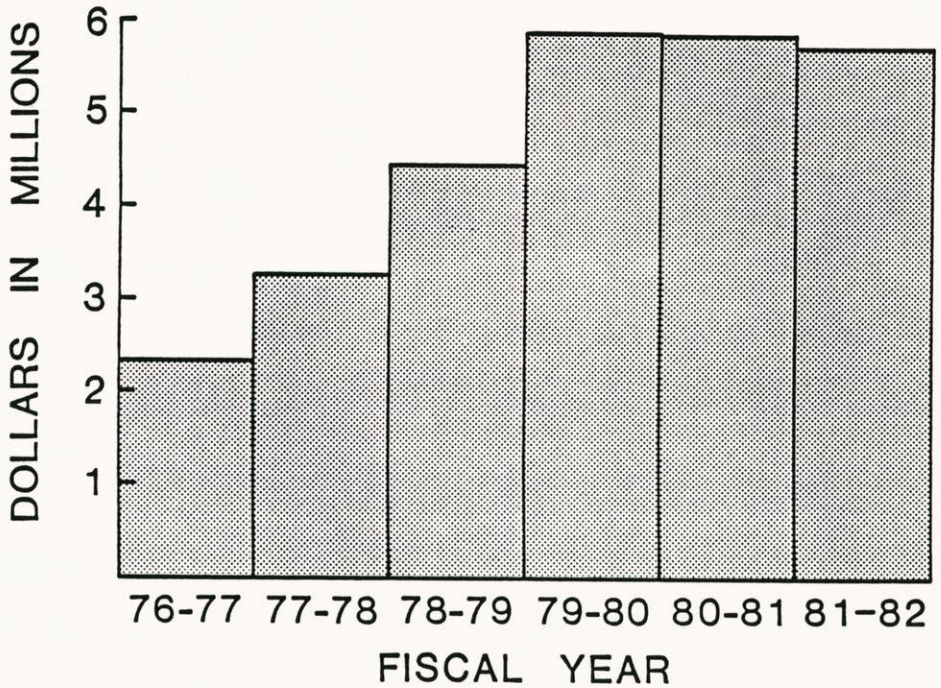


FIGURE 6
EXTRAMURAL SUPPORT

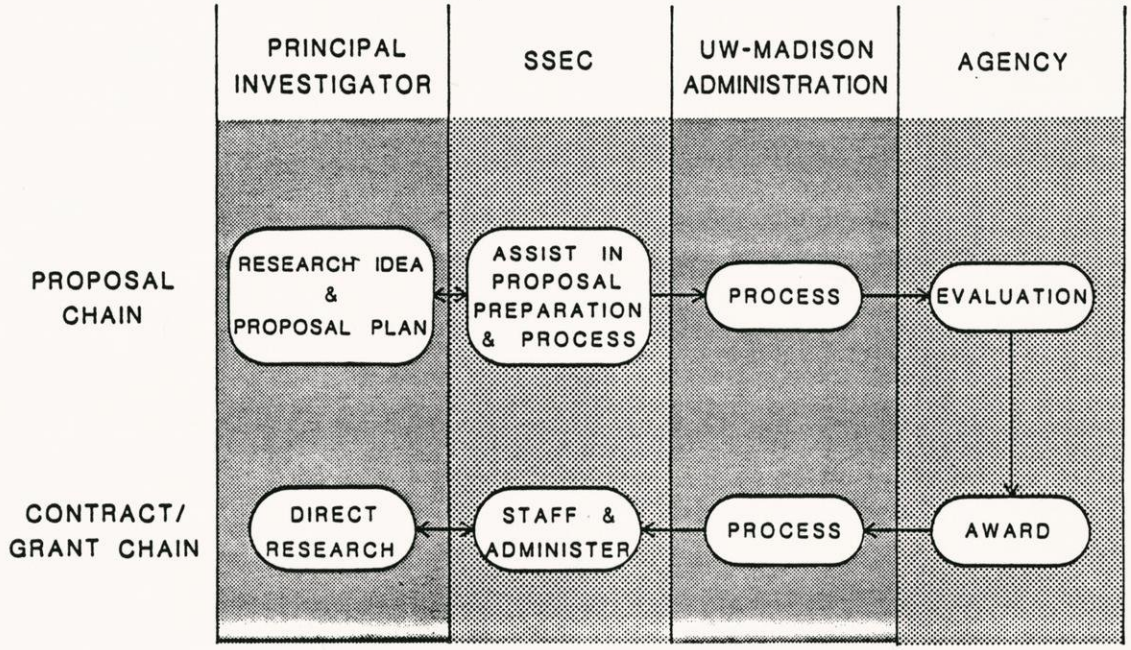
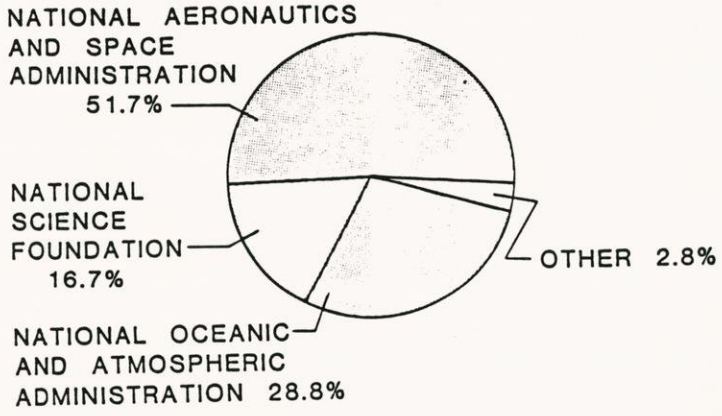


FIGURE 7
1982 EXTERNAL FUNDING SOURCES



Space & Astro - SSEC

University Communications

News Releases

UNIVERSITY OF WISCONSIN MADISON

December 16, 1999

TO: Editors, news directors
FROM: Terry Devitt, 608/262-8282
RE: Weather satellites for a new millennium

Building on a tradition that dates back 35 years to the first geostationary weather satellite, UW-Madison's Space Science and Engineering Center (SSEC) has been selected to help NASA develop a new generation of satellite technology that promises to greatly improve weather forecasting and the monitoring of atmospheric pollutants.

This week NASA selected SSEC as a key partner to help design and build an instrument known as GIFTS for Geostationary Imaging Fourier Transform Spectrometer.

SSEC will receive $10 million over five years from NASA to design and calibrate GIFTS and to write the software codes that will make the instrument's data useful to forecasters and scientists. Based in part on technology developed at UW-Madison, GIFTS will be a part of NASA's Earth Observing Mission 3 and will be launched into orbit sometime in 2003.

GIFTS, according to SSEC Interim Director Hank Revercomb, will be capable of dissecting the atmosphere in a far more detailed way than current geostationary weather satellites by looking at the weather across a wide swath of the spectrum of energy that the Earth radiates into space. GIFTS, says Revercomb, will observe the Earth in more than a thousand spectral bands, providing scientists with a wealth of new information and a way to read the nuances of such things as tornadoes, hurricanes and the movement and distribution of chemical gases and particles found in air pollution.

GIFTS will permit forecasters to greatly hone the accuracy of three-day weather predictions and extend the duration of forecasts up to five days, says Ghassem Asrar, NASA's associate administrator for earth science. In addition to instrument design and development, the contract to UW-Madison includes significant support for a broad education and public outreach effort.

For more information, contact Hank Revercomb, (608) 263-6758; hankr@ssec.wisc.edu, or Terri Gregory, (608) 263-3373; terri.gregory@ssec.wisc.edu
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UNIVERSITY OF WISCONSIN MADISON

FOR IMMEDIATE RELEASE
6/28/01
CONTACT: Terri Gregory, (608) 263-3373, terri.gregory@ssec.wisc.edu

NASA BRINGS ADVANCED AIRCRAFT TO WISCONSIN

MADISON - A new aircraft used for atmospheric research will visit Madison's Truax Field Monday, July 9, brought here by the University of Wisconsin-Madison's Space Science and Engineering Center and hosted by the 115 Fighter Wing, Wisconsin Air National Guard.

The Proteus, a high-altitude long-duration instrument platform, has two sets of wings that give it the appearance of a long skinny biplane. Its modular construction allows it to fly high or low in the atmosphere and carry different sizes of payloads in a pod under the aircraft.

It can be flown with or without a pilot at the controls. It will be piloted when it comes to Madison.

Proteus was built by California's Scaled Composites Inc. and is based at the company's Mojave, Calif., facility near NASA's Dryden Flight Research Center, which is home to the ER-2, the NASA high-altitude plane most familiar to Wisconsin residents.

The Proteus will swoop in to Truax to retrieve a NASA instrument that was trucked to Madison for comparison tests with SSEC instruments. The work is in preparation for a field experiment called CLAMS, for Chesapeake Lighthouse and Aircraft Measurements for Satellites.

CLAMS takes place this summer off the coast of Virginia Beach, Va. Primarily, the experiment seeks to refine the way current and future satellites measure aerosols and heat reflected by earth and sea. Instrument teams from NASA, University of Washington and UW-Madison's SSEC will collaborate on the project.

According to National Guard Major David Olson, no public tours or viewing are planned on base. but the Proteus is expected to arrive at noon Monday, July 9, and leave in the early morning of Tuesday, July 10. Research aircraft generally use the North-South runway, which can be viewed from the Madison airport, or any nearby vantage point.
# # #
On the Internet:
CLAMS: http://www-clams.larc.nasa.gov/clams/
Proteus: http://www.scaled.com/projects/proteus/proteus.htm
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UNIVERSITY OF WISCONSIN MADISON

FOR IMMEDIATE RELEASE
12/6/2000
UNIVERSITY OF WISCONSIN-MADISON NEWS BRIEFS

Event marks 20 years of weather satellite research
-- Business dean heads blue-ribbon committee
-- Gallery in Overture to be named after Watrous

EVENT MARKS 20 YEARS OF WEATHER SATELLITE RESEARCH

CONTACT: Terri Gregory, (608) 263-3373; terri.gregory@ssec.wisc.edu

MADISON -- Up on the rooftop, forecasters pause -- to mark 20 years of advances in satellite meteorology that has changed the nature of weather research.

The University of Wisconsin-Madison Space Science and Engineering Center will celebrate major technological and organizational achievements in satellite meteorology Thursday, Dec. 14, on top of the Atmospheric, Oceanic and Space Sciences building, 1225 W. Dayton St.

The event marks the 20th anniversary of the Cooperative Institute for Meteorological Satellite Studies (CIMSS), a UW-Madison and federal partnership based in weather satellite technology. In the latest advance, SSEC has installed a new rooftop antenna that routes data from NASA's Earth science research satellite, Terra, to an SSEC archive and to the scientific community.

The rooftop remarks at 2:15 p.m. by NASA's Jim Dodge and SSEC researcher Liam Gumley will be followed by talks in the State Historical Society's Auditorium, 816 State St. Starting at 2:45 p.m., scientists William L. Smith and W. Paul Menzel will give perspectives on 20 years of CIMSS research and development and a glimpse at future technology.

Smith directed CIMSS from 1984 through 1997, when he left to direct atmospheric science at NASA's Langley Research Center in Virginia. Menzel, chief scientist in National Oceanic and Atmospheric Administration's National Environmental Satellite, Data, and Information Service, has worked closely with CIMSS since it began in 1980.

Following the presentations, a 4 p.m. reception in the Pyle Center's Lakeside Alumni Lounge, 702 Langdon St., features a plaque presentation to CIMSS Director Steven Ackerman.

BUSINESS DEAN HEADS BLUE-RIBBON COMMITTEE

CONTACT: Andrew J. Policano, (608) 262-1758;
Helen Capellaro, (608) 262-9213

MADISON -- University of Wisconsin-Madison Business School Dean Andrew J. Policano has been chosen to lead a blue-ribbon committee on accreditation quality for the International Association for Management Education.

The 11-member committee, consisting of deans of major business schools, is proposing a fundamental change in the accreditation process to reflect the new realities faced by business schools.

Policano says business schools need to acknowledge dramatic changes in their industry, including new methods of delivering the curriculum, smaller tenure track faculty, and an increasing cadre of executive and non-tenure track faculty.

"The standards have to adjust to these different modes of delivery, whether it be distance education, utilizing the Internet, or non traditional faculty members delivering the curriculum," he says. "In addition, the accreditation process and standards must be flexible enough to apply to business schools globally."

The committee plans to present a conceptual framework in April at the AACSB annual meeting in New York.

GALLERY IN OVERTURE TO BE NAMED AFTER WATROUS

CONTACT: Robert G. Lange, (608) 263-1692, ext. 12; rglange@facstaff.wisc.edu

MADISON -- The Wisconsin Academy of Sciences, Arts and Letters' new gallery in the Overture Center in Madison, to open in 2004, will be named after the late, distinguished art historian and artist, James S. Watrous.

The designated exhibition space for works by state and local artists will be called The James S. Watrous Gallery of the Wisconsin Academy," honoring Watrous (1908-1999), whose career as a teacher, art historian, painter, author, muralist, and mosaicist was devoted to serving the University of Wisconsin.

The tribute is made possible by a gift from the family of James and Margaret Watrous.

Robert G. Lange, executive director of the Wisconsin Academy of Sciences, Arts and Letters, says Watrous was an influential artist whose "most lasting gift was that of serving as a cornerstone of, and advocate for, culture and civilization in Wisconsin and beyond in the broadest sense."

The Wisconsin Academy Fellows program honors Wisconsin residents whose dedication to knowledge and culture have led to extraordinary contributions to our state.

The James S. Watrous Gallery of the Wisconsin Academy will be located on the top level of a multistory rotunda that will serve as the main entry area to the Overture Center, the $100 million arts complex slated to open on Madison's State Street in 2004.

The Wisconsin Academy Gallery, in operation since 1974, is a juried, noncommercial showcase for Wisconsin visual artists working in various media. The academy's current space is at 1922 University Ave.
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FOR IMMEDIATE RELEASE
August 2, 2000
CONTACT: Terri Gregory, (608) 263-3373; terri.gregory@ssec.wisc.edu Paul Menzel, 608-263-4930; Liam Gumley, 608-265-5358

(NOTE TO EDITORS: Streets near the Atmospheric, Oceanic and Space Sciences Building, 1225 W. Dayton St., will be closed Saturday, Aug. 5, to safeguard residents and passersby during the antenna lift. If delayed by weather, the lift will be Sunday, Aug. 6.)

NEW EARTH SCIENCE DATA TO STREAM INTO UW-MADISON

MADISON -- UW-Madison will have access to a new generation of global earth science data after a helicopter raises a new satellite tracking antenna to the top of the building housing the Space Science and Engineering Center this Saturday, Aug. 5.

To protect it from the elements, the antenna will be housed inside a 22-foot diameter radome. The helicopter will place the antenna-radome structure on top of a 40-foot tall tower that was airlifted to the roof last Nov. 27.

The structure will receive data from NASA's Terra satellite, launched Dec. 18. Using a suite of advanced scientific instruments, scientists now are able to study the Earth in unprecedented detail. For example, UW-Madison's SSEC researchers helped develop a key instrument aboard Terra, the Moderate Resolution Imaging Spectroradiometer (MODIS), which acquires images of the entire surface of the Earth every two days. MODIS monitors the Earth's land, ocean and atmosphere in many different channels, or wavelengths, that look at light in very different ways.

Scientists may combine channels or view them separately to see trends in regional and global weather. UW-Madison is developing and distributing software to research institutions around the world to help the global science community efficiently use the data.

SSEC's Liam Gumley, program manager of the effort to create scientific products

SSEC's Liam Gumley, program manager of the effort to create scientific products from MODIS data, says the new antenna will receive data when Terra is flying over the continental United States. Unlike the large dishes on top of the roof which receive global data from geostationary satellites that remain at the same equatorial location in the sky, Terra orbits the earth from pole to pole at about 800 miles in altitude.

"That makes it possible to cover the whole U.S. and much of central Canada from our Madison location," Gumley says. "This antenna gives SSEC and UW-Madison the ability to receive this high-quality data in real-time as it is seen by MODIS on the spacecraft."

The launch of Terra's sister spacecraft, Aqua, in December will double the information flowing from to researchers, Gumley says. SSEC is one of four U.S. installations that will receive MODIS data.

SSEC researcher Christopher Moeller is pleased that information on cloud, atmospheric water vapor and aerosol distribution, land and ocean surface characteristics, and biological activity will be available in real time.

"Now we can evaluate the evolution and interaction of these complex Earth processes," Moeller says. "This monitoring will lead to an improved understanding of the earth as a system, rather than as a series of seemingly isolated events."

Paul Menzel, a NOAA chief scientist stationed at UW-Madison, is organizing international users of the MODIS data. "The new capabilities of MODIS offer exciting science opportunities for monitoring and understanding the interactions between land, ocean and atmosphere," Menzel says.

Once MODIS data begins streaming into SSEC, researchers will monitor the data for new signatures of global change, in part by combining MODIS measurements with those of the other geostationary satellites. SSEC already is the NOAA national archive for the older satellites' information. Data from MODIS will greatly expand and enhance SSEC's archive, made available to scientists throughout the world.
# # #
For more information on the Web:

-- Space Science and Engineering Center: http://www.ssec.wisc.edu/
-- More about MODIS: http://ltpwww.gsfc.nasa.gov/MODIS/
-- Software information: http://cimss.ssec.wisc.edu/~gumley/IMAPP/IMAPP.html
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UW-MADISON CONTINUES TO AID IN HURRICANE MITCH RECOVERY

MADISON -- The University of Wisconsin-Madison's Space Science and Engineering Center is working with other agencies in the continuing effort to help Central America recover and rebuild after Hurricane Mitch's devastation in 1998.

The U.S. Congress approved millions of dollars for recovery efforts via U.S. AID, but recovery costs for the region are estimated in the billions. Many infrastructure and preparedness issues still remain unaddressed, including the ability to receive timely weather data.

As part of U.S. government contributions to the area's recovery, UW-Madison's SSEC is working to improve the area's ability to respond to natural disasters by enhancing their access to weather information.

SSEC's Cooperative Institute for Meteorological Satellite Studies, together with the National Oceanic and Atmospheric Administration, will supply and help install a satellite ground receiving station that will serve a number of Central American countries, including four hit by Mitch. Others are supplying training and workstations for display and analysis of satellite data, while SSEC provides hardware and installation support. Robert Oehlkers, a senior instrumentation technologist, is heading up the effort for UW-Madison.

The new system will augment Central America's access to both geostationary and polar orbiting satellite data. The first provides frequent imagery and atmospheric information over the entire western hemisphere while the second provides high-resolution data twice a day.

Denise Laitsch, SSEC's manager for this project, stresses that SSEC is a long-standing provider of weather data.

"We've been a primary source of global satellite imagery for decades," Laitsch says. "It's good to see access opening up to Central America."

On the Web:
NOAA project information: http://discovery.osd.noaa.gov/mitch/index.htm
UW-Madison SSEC: http://www.ssec.wisc.edu/
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ATMOSPHERIC SCIENTISTS TAKE TO THE SKIES AGAIN

MADISON -- The Wisconsin Snow and Cloud-Terra 2000 experiment will take place Feb. 25-March 13, based at Madison's Truax Field.

The experiment is the third in a series sponsored by the University of Wisconsin-Madison's Space Science and Engineering Center.

Like experiments in 1997 and 1999, the latest project will bring to Madison NASA's ER-2, a high-altitude research plane that acts as a platform for developing and proving new scientific instruments used on satellites.

Scientists will use the ER-2 instrument measurements to validate science products from NASA's new earth observing satellite Terra, which began its five-year mission following its launch into orbit Dec. 18.

SSEC helped develop the Moderate-Resolution Imaging Spectroradiometer (MODIS), one of five instruments on Terra. MODIS is making global measurements of clouds, ocean, land, and atmospheric properties in an effort to monitor and predict global climate change.

During the experiment, SSEC will work closely with NASA's Goddard Space Flight Center, which will collect and distribute the MODIS data and science products.

The ER-2 will fly over the Upper Midwest and Oklahoma, coordinating ER-2 measurements with data from the Department of Energy's CART site in Oklahoma, where scientists will be engaged in a complementary cloud experiment at about the same time as the Wisconsin experiment.

Details will be posted on the Web at: http://cimss.ssec.wisc.edu/wisct2000/
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Advances gives a glimpse of the many significant research projects at the university. Tell us about your discoveries by e-mailing: wisweek@news.wisc.edu.

Atmospheric scientists take to the skies again

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Details will be posted on the Web at: http://cimss.ssec.wisc.edu/wisct2000/

Discovery may advance drug development

In a breakthrough that could revolutionize the development of drugs to treat cancer and other diseases, Medical School researchers have identified the molecular basis through which a family of enzymes involved in several life-threatening diseases communicates to cells.

Richard Anderson, professor in the Department of Pharmacology, and postdoctoral fellow **Jeannette Kunz** have discovered how a family of 13 closely related enzymes produces "second messengers," molecules that regulate many functions throughout the body. These second messenger molecules carry instructions to cells, signaling them to grow, move about, communicate with other cells and respond to threats to the body's immune system.

What had baffled researchers for years was the question of how this particular family of enzymes, each of which has a similar chemical structure and appearance, could produce wildly different secondary signaling messengers.

Kunz and Anderson's research has pinpointed the answer: an activation loop composed of a short sequence of amino acids is the agent responsible for determining which secondary messengers are produced by each enzyme.

Armed with this knowledge, pharmacologists will now be able to begin designing drugs that can either block the enzymes from creating the signaling messengers or stimulate them to create more.

CALS counsels caution on alternative crops

Increasingly, growers are looking at alternative crops, farm enterprises such as bed and breakfasts and tourism, and other business diversification strategies to improve their farm profits and the quality of their lives.

Goldenseal, Echinacea (coneflower), garlic, shiitake mushrooms and aquaculture are a few alternatives that have been in the spotlight the past few months because of the decline in farm prices.

"For those just getting into alternative markets, it is important to recognize that a lot of information out there is little more than hype. It is your job as a potential grower to learn how to distinguish between meaningful information and what is just trying to lure you into an alternative crop," says **John Hendrickson**, outreach specialist.

Growers should know where their buyers are and how much product is needed. And farmers need to carefully consider the price volatility of many alternative crops.

Production links art and politics to real lives

Barbara Wolff

The sights and sounds of revolution came to 17-year-old Valentin Robu from his family's television. He recalls the 1989 overthrow of Nicolae Ceausescu's government in Romania as a joyful time, full of hope and possibility.

"I'm from a small town, Piatra Neamt in Moldavia, in northeastern Romania. In my town everything was quite quiet," since most of the action took place in the capital city of Bucharest, about 200 miles from Piatra Neamt, he says. "My friends and I were really excited, and we started to dream a lot about our free future. One of my dreams was to study in the United States, and here I am!"

Robu has been a university graduate student in physiology since 1998. These days he also is an adviser to the cast and crew of "Mad Forest," opening Friday, March 3, at the University Theatre.

British playwright Caryl Churchill created the play in a year after the overthrow. To find the stories that make up the play, she combed the streets of post-revolutionary Bucharest to examine the coup's aftermath.

According to Robu, the overthrow had been an exercise in deception. "Some people call it a 'stolen revolution,'" he says. "I was amazed at how well the play got at the truth, given the time in which it was written — a lot of Romanians didn't realize they had been lied to and that the path the country was on was false."

Fellow "Mad Forest" adviser Alexandru Dinu, a graduate student studying anthropology, has a different take on the play, believing it cuts too narrow a swath through Romanian society a decade ago.

"I hope that both the cast and the audience will understand that the playwright spent only a short time in Romania, and had only a small number of informants belonging to only a single social group. Their ideas were not necessarily shared by everyone, and what is said (in the play) should not be generalized," he warns.

Last year presented Dinu with his first opportunity in 14 years to visit his family. Like Robu, he had watched the revolution on television. Like Robu, Dinu feels a sense of betrayal by the changes that the uprising brought.

"Today, it is the general consensus that life was much better under Ceausescu, which I found to be true when I went home this winter. The revolution gave great opportunity to the lowest elements of Romanian society to take over and destroy our culture, economy and the historic legacy left by our heroes. It seems true that the only solution will be another revolution," Dinu says.

Such powerful sentiments have not been lost on the "Mad Forest" cast and crew. Stage manager Antigoni Sander, a UW-Madison junior majoring in theatre and drama, says the presence and guidance of the Romanian advisers will lend the production emotional depth, historical context and cultural authenticity.

"Many of us on the production knew very little about Romania. Having them come in really helped us," Sander says. ■

Student actors Aaron Mize, Jason Schumacher and Miles Hartley rehearse a scene from the new University Theatre production of "Mad Forest" an account of the Romanian revolution by Caryl Churchill, opening Friday, March 3.
Photo: Courtesy University Theatre

"Mad Forest" runs March 3-5, 8, 9 and 23-25 in the Mitchell Theatre of Vilas Hall. Tickets: $10 general/$7 students, Vilas Hall Box Office, 262-1500.

University staffers bring home the world

Kerry Hill

Two university staff members have brought a far-off part of the world right into their homes this year, by hosting foreign high school students through AFS Intercultural Programs.

"We get to see our lives through someone else's eyes," says Rachel Rothschild, assistant dean in the School of Veterinary Medicine, who is host mom to Karla, from Venezuela. "We get to rethink habits and assumptions. Our daughter, Cody, has a sister she would not otherwise have had."

Donna Veatch, international program specialist with the Office of International Studies and Programs, says she has enjoyed "watching Surama (from Brazil) enjoy her first snow, open presents on Christmas morning, and seeing her learn things she would not see and learn about in her country. We also enjoy meeting her AFS friends from many other countries."

For both Veatch and Rothschild, past experiences inspired their families' decision to become hosts.

"Because of our travels and work with 'Up With People,'" Veatch says, "both my husband Bob and I have stayed with about 300 host families, so we know well what a rewarding experience it can be for both host and guest."

Also, Veatch's family hosted an AFS student from Japan in 1978, when she was a senior in high school.

"Two years after her return, my parents and I visited her and her family in Japan," Veatch says, "and she toured us through her country for two weeks. She came back for my wedding 10 years ago and my parents visited her again this past year in Japan. As always, she is part of our family."

"Our decision to host now grew out of our son Justin's experience as an AFS student in Panama in 1998-99," says Rothschild, who also lived abroad as a teenager. "We were struck by the extraordinary generosity of host families all over the world as they make room in their homes and their lives for young people from other countries who are having life-altering adventures. We wanted to be part of that."

As AFS begins its search for host families in the Madison area for the next school year, Rothschild and Veatch are recommending the experience. The value of hosting, Veatch says, is "connecting people in the world — unfamiliar places become the people you love, not just a 'foreign country.'"

"The AFS organization functions extremely well without being bureaucratic," Rothschild says. "We have experienced this now as both sending and hosting parents. We knew there would be support of all kinds for us as a host family whenever needed. Then, when we read Karla's AFS application, the decision was easy."

An AFS host family can be a single individual or parent, a couple with or without children living at home, from 20-something through retirement age. All host families are expected to supply love, moral support, comfort and basic needs for their hosted student. AFS students bring their own spending money and clothing — and come with full medical insurance coverage.

AFS is an international, voluntary, non-governmental, non-profit organization that provides intercultural learning opportunities to help people develop the knowledge, skills and understanding needed to create a more just and peaceful world. ■

To learn more about AFS, its history and programs, visit http://www.afs.org. For a free brochure and host family application, or to speak with a representative, call (800) AFS-INFO. E-mail: afsinfo@afs.org. In Madison, call 246-0153. E-mail: kghill@execpc.com.

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LEARNING

Student inventors prepare for Brainstorm competition

Inspired student inventors are making final adjustments to their entries for the 2000 "Brainstorm: Schoofs Prize for Creativity" sponsored by the College of Engineering.

Now in its sixth year and open to all undergraduates, the contest awards cash prizes to those whose ideas are judged most creative, novel, innovative, patentable and likely to succeed in the marketplace.

Winners will be announced on Edison Day, Friday, Feb. 11. Edison Day is the College of Engineering's annual celebration of Thomas Edison's birthday. Students will present their work in 1610 Engineering Hall. Projects will be on display in the Engineering Hall lobby through the day.

RESEARCH

Older husband caregivers face significant changes

A recent study of the caregiving role among older husbands has found that husbands who transition into caregiving are less happy, more depressed and more inclined to think that their marriage is in trouble than married men who do not transition into this role.

The study, based on data from the National Survey of Families and Households, was done by Betty J. Kramer, assistant professor of social work at UW-Madison, and James David Lambert of Edgewood College in Madison. The study was published in the December 1999 issue of The Gerontologist.

The study found that husbands who entered the caregiving role showed evidence of potentially detrimental changes in their marital relationship. They showed a decline in marital happiness and a feeling that their marriage was in trouble. "We do not know how many later-life marriages end in divorce as a result of illness," but, Kramer and Lambert suggest, more attention must be given to potential implications of these findings for later-life families. While not surprising, the findings do suggest that men caregivers are vulnerable and that caregiving does not come easily to older men.

MILESTONES

Business in Forbes top 10

The School of Business ranked ninth in a national survey of business schools that provide the best bang for the buck.

Forbes magazine ranked 25 national business schools and 25 regional business schools according to the return on investment students can expect from attending those schools.

The overall winner? Harvard. Its grads gained the most from going back to school, notwithstanding that their costs — tuition and pre-enrollment salaries — were the highest. Madison ranked in the top 10 among regional business schools.

To calculate the worth of a university master's of business administration degree, Forbes compared the salary gains it generated to the cost of getting the degree.

Forbes' ranking differs from the usual business-school ratings, which compare schools based on salary offers of recent graduates but take no account of the fact that schools vary widely in how much their students were making before they enrolled, as well as five years out of school.

Yale executive to head clinical trials office

The Office of Clinical Trials at the Medical School has hired a new director.

Tesheia Johnson, who had been clinical trials administrator for several departments at the Yale University School of Medicine, was selected by a search committee of UW physicians and administrators. She began work in Madison Jan. 19.

A graduate of the University of South Carolina, Johnson also has an MBA and a master's of health sciences from Quinnipiac College in Connecticut. At Yale, she most recently served as administrator for clinical trials in surgery and pediatrics. Earlier, she was responsible for overseeing the Yale Child Health Research Center, where she coordinated the efforts of more than 70 scientists and oversaw day-to-day operations of the school's then-new basic-research facility. Johnson also has hospital administrative experience.

OCT, established in 1989, helps UW Medical School faculty obtain, manage and conduct privately funded clinical research. One of the oldest clinical trials offices in the country, it provides budget preparation and negotiation, streamlines the execution of contracts, helps prepare and file regulatory documents and submissions to the Institutional Review Board, and develops communications for people who agree to take part as subjects in research

Business center plans anniversary celebration

UW-Extension's Small Business Development Center, which provides counseling and management education for small-business owners, has completed 20 years of service to Wisconsin's entrepreneurs.

The SBDC will mark its anniversary with a celebration at the Pyle Center on Wednesday, Feb. 9. Wisconsin Secretary of Commerce Brenda Blanchard will be the featured speaker.

"Statewide, we have provided one-on-one counseling and have delivered relevant educational programs for nearly 280,000 entrepreneurs in the last two decades," says Erica Kauten, SBDC state director. "Our network is the largest provider of entrepreneurial services in Wisconsin. Independent studies show that this translates into entrepreneurial success, job creation and community vitality throughout the state."

Survey unit to close

Because operations by the UW-Extension Wisconsin Survey Research Lab in Madison cost more than its customers pay, will cease operations when current contracts are completed, possibly by June 30.

The extension' s agency had one of the nation' s first computer-assisted telephone interviewing systems. The agency has an annual budget of $2.5 million without state funding. It was financed by public-opinion surveys and other research for governments and companies.

The agency is not connected to the UW Survey Center, which will continue operating as usual.

ON CAMPUS

'Snowflake Bentley' author to speak Feb. 4 on campus

Before the snow melts, it is being celebrated by campus libraries with a public lecture and discussion titled "Let it Snow! Let it Snow! Let it Snow!"

The talk features Jacqueline Briggs Martin, author of the award-winning children's book "Snowflake Bentley." Martin will give a reading at 124 Memorial Library at 4 p.m. Friday, Feb. 4.

Martin's book, which was illustrated by Mary Azarian, won the 1999 Caldecott Medal for the year's most distinguished picture book. The book chronicles the life of Wilson A. Bentley, a Vermont dairy farmer who was the first person to photograph snow crystals in the late 1800s.

The following campus libraries are hosting related exhibits: Geology and Geophysics, Kohler Art, Middleton Health Sciences, Memorial, Schwerdtfeger Space Science and Engineering, and Wendt Engineering. Each exhibit includes works by Bentley, which were acquired as lantern slides in the early 1900s by a UW physics professor named, ironically, Benjamin Snow.

The lecture is sponsored by the General Library System and the School of Education Cooperative Children's Book Center. Martin also will give a talk at Canterbury Booksellers, 315 W. Gorham St., at 11 a.m. Saturday, Feb. 5.

Lecture looks at art and social morals

Can art be immoral? That's the question Noel Carroll will pose in a Friends of the UW-Madison Libraries lecture at 4:30 p.m. Wednesday, Feb. 9. Carroll, the Monroe C. Beardsley Professor in the Philosophy of the Arts, gives the inaugural talk in the Friends spring lecture series.

The lecture, titled "Can Art be Immoral? The Paradox of Oscar Wilde," will be accompanied by readings by D. Scott Glasser from Oscar Wilde's "The Picture of Dorian Gray." Glasser is artistic director of the Madison Repertory Theater and is directing the Rep's upcoming production of "Gross Indecency: The Three Trials of Oscar Wilde."

The lecture and readings will be in the Department of Special Collections, 976 Memorial Library.

WUD seeks officers for 2000-01 academic year

Faculty and staff may wish to recommend students willing to serve as Wisconsin Union Directorate officers. The jobs of president and two vice-presidents are open for the next academic year at WUD, the student-run program council.

Eleven WUD committees consist of hundreds of student volunteers who create, manage and promote more than 800 events and activities each year, including film, art, music, Alternative Breaks, Hoofers, the Distinguished Lecture Series, and others.

Applications, available in 507 Memorial Union, are due Monday, Feb. 7. Officers receive a stipend equivalent to two semesters of in-state undergraduate tuition spread out via monthly payments over the academic year, according to Linda Stitt, WUD program director.

UPDATE

SECC campaign passes goal

It was a banner year for the State, University and UWHC Employees Combined Campaign of Dane County. It surpassed its $2.2 million goal for 1999, thanks to the generosity of more than 11,500 "partners in giving."

As of Jan. 19, contributions to the annual charity fund-raising campaign totaled $2,258,399, the largest amount

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LEADERSHIP

Finalists named for diversity position

Three finalists have been named for the position of assistant vice chancellor for workforce equity and diversity:

Luis A. Piñero, interim assistant vice chancellor/director of the Equity and Diversity Resource Center. Piñero joined the EDRC in 1982, when it was known as the Office of Affirmative Action and Compliance.

Andrea L. Turner, executive director for the University of Minnesota Board of Regents. Turner was previously employed as a special assistant to the chancellor and also as executive director of multicultural affairs at UW-Stevens Point.

Vicki C. Washington, director of Equal Opportunity and Diversity Programs and assistant to the chancellor, University of Wisconsin-Extension. Washington held several affirmative action-related positions in the public and private sector in North Carolina before joining UW-Extension.

The assistant vice chancellor for workforce equity and diversity promotes increased employee diversity throughout the university; oversees the Equity and Diversity Resource Center; and ensures campus compliance with affirmative action/equal employment opportunity regulations.

The opening was created when Greg Vincent accepted a position last summer as vice provost for campus diversity at Louisiana State University.

University officials expect to fill the position in late January or early February.

LEARNING

IES starts student exchange

New study-abroad opportunities are in the works for next fall, when the Institute for Environmental Studies will offer its first trans-Atlantic exchange program.

The U.S. Department of Education has awarded IES a three-year, $179,598 grant to promote student exchanges in comparative ecosystem studies between three American universities and three in Europe.

The European institutions are the University of Bayreuth, Germany; the Autonomous University of Barcelona, Spain; and the Technical University of Lisbon, Portugal. The other two American schools are the University of Missouri-Columbia and San Diego State University.

Enhancing interdisciplinary education in sustainable ecosystems management is the primary goal of the exchange program. Among other things, it will help students learn to work across agency and organizational lines, bridge academic disciplines and bring cultural sensitivity to their career endeavors in environmental fields.

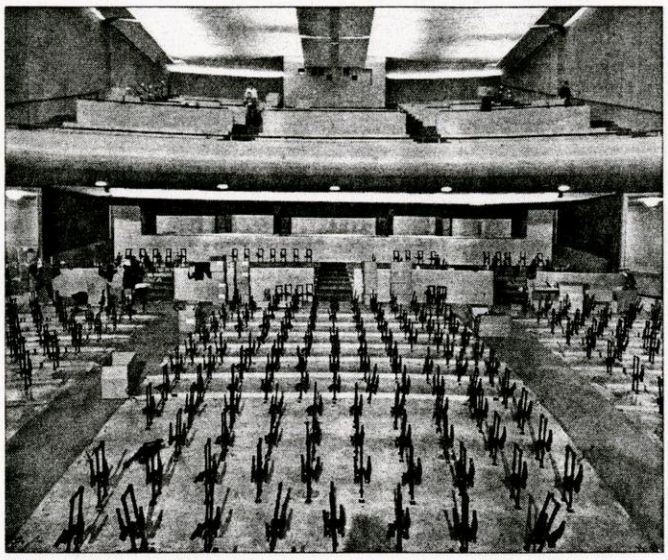
Why Files launches course online


Banfield

A new university online science course in geology is based on the content of the popular Why Files Web site, http://whyfiles.news.wisc.edu. The new course, Geology 115, The Science Behind the News — The Universe Around Us, will be taught for the first time next semester.

Intended for non-science majors, the course is the brainchild of Jill Banfield, a professor of geology and geophysics and the recent recipient of a prestigious MacArthur fellowship or "genius award." Banfield says mining the content of The Why Files — a site that has sought to demystify for popular audiences everything from cloning to earthquakes — would provide a natural matrix for an online science course.

"It's important that people are introduced to science and that content is accessible to the average person," Banfield says. "The Why Files does make science accessible in a very friendly way."



Take our seats, please
Workers began reinstalling Wisconsin Union Theater seats in the first complete renovation of seating since the theater opened in 1939. The 1,300 chairs were removed last month and taken to a Michigan company for restoration. Workers will be working feverishly to reinstall the seats before the first performance scheduled later this month. The original color of the seats, called Titian, will be maintained to preserve historical accuracy.
Photo: Jeff Miller

OUTREACH

Anti-smoking effort reaches out statewide

A five-part plan, including a toll-free stop-smoking helpline and a program to prevent smoking among adolescent girls, will send $2 million in state tobacco settlement money to communities around Wisconsin, Medical School officials say.

The school's Center for Tobacco Research and Intervention (CTRI), a national leader in research efforts to help people stop smoking, received $2 million in the recently passed state budget for tobacco-control efforts. The funds are part of the settlement negotiated with major tobacco companies, which were sued by Wisconsin and many other states.

The five-part plan includes an annual statewide survey tracking tobacco use in Wisconsin; a statewide partnership with the Wisconsin Women's Health Foundation to help prevent smoking among young women; a statewide educational and outreach program that includes Milwaukee, Green Bay, Rhinelander, La Crosse and Madison; a "mini-grant" program that will support local research efforts in smoking cessation and prevention; and a toll-free helpline offering counseling to smokers trying to quit.

Adds Director Michael Fiore: "CTRI will work collaboratively with the Wisconsin Department of Health and Family Services, the new state Tobacco Control Board and other entities committed to these efforts."

RESEARCH

NASA satellite technology to be developed here

Building on a tradition that dates back 35 years to the first geostationary weather satellite, UW-Madison's Space Science and Engineering Center (SSEC) has been selected to help NASA develop a new generation of satellite technology that promises to greatly improve weather forecasting and the monitoring of atmospheric pollutants.

NASA selected SSEC as a key partner to help design and build an instrument known as GIFTS (Geostationary Imaging Fourier Transform Spectrometer).

SSEC will receive $10 million over five years from NASA to design and calibrate GIFTS and to write the software codes that will make the instrument's data useful to forecasters and scientists. Based in part on technology developed at UW-Madison, GIFTS will be a part of NASA's Earth Observing Mission 3 and will be launched into orbit sometime in 2003.

GIFTS, according to SSEC Interim Director Hank Revercomb, will be capable of dissecting the atmosphere in a far more detailed way than current geostationary weather satellites by looking at the weather across a wide swath of the spectrum of energy that the Earth radiates into space. GIFTS also will permit forecasters to greatly hone the accuracy of three-day weather predictions and extend the duration of forecasts up to five days.

COMMUNITY

Y2K OK: No problems reported

Campus facilities and utility systems did not experience any known Y2K problems, the Physical Plant reports.

Thirty Physical Plant employees and staff members worked overnight Dec. 31 monitoring various campus systems, building equipment, power

UW scientists seek early warning of water threats

Brian Mattmiller

A UW-Madison research team will be mixing up a batch of "pathogen cocktails" in the laboratory, with the goal of countering disease-causing threats to drinking water.

Civil Engineering Professor Greg Harrington is leading a two-year project to determine how well water-treatment technologies remove *Cryptosporidium* and other microorganisms before they reach the kitchen tap.

The $250,000 project is funded by the U.S. Environmental Protection Agency and the American Water Works Association Research Foundation, an international nonprofit group devoted to drinking-water quality. Joining Harrington in the project will be Jon Standridge and David Battigelli, scientists at the Wisconsin State Laboratory of Hygiene.

"If we revie waterborne outbreaks of infectious disease in the United States, we find that the culprit was identified in only about half the cases," says Harrington. "There are numerous microorganisms, but detection methods are available for only a small fraction."

This project will focus on a half-dozen pathogens of future concern as a health threat in drinking water, he said. After growing pathogens in the lab, the researchers will add the pathogen-spiked "cocktails" to drinking water treatment systems to evaluate the ability of different treatment techniques to remove the bugs.

The two pathogens of greatest concern since 1980 have been *Giardia* and *Cryptosporidium*, and both have caused major health threats in the United States. The most serious was the 1993 *Cryptosporidium* outbreak in Milwaukee, in which 69 people died of complications arising from the outbreak.

Harrington's team will take a forward-looking view: Is there another emerging pathogen on the horizon that could unexpectedly threaten public health, in the same way crypto has in the past decade?

"*Cryptosporidium* is not the only microorganism of concern in drinking water," says Battigelli. "Although crypto has been the industry buzzword since 1993, we are finding other microorganisms which may also pose substantial risks to public health if left unaddressed."

There is reason to suspect a "new crypto" could be lurking, Harrington says. Since scientists have only recently been able to accurately detect many of the waterborne pathogens that cause illness, some newly identified types may have been causing low levels of disease for years.

That's true of several pathogens in the study. A class of viruses called caliciviruses has been traced to recent waterborne outbreaks in the United States. The bacterium *Escherichia coli 0157:H7*, has caused at least two waterborne outbreaks that affected more than 300 people. In North and South America, the parasite *Cyclospora* has caused serious health problems.

Battigelli noted that medical treatment is not available for some diseases caused by these pathogens. In many cases, people rely exclusively on their body's immune system to fight them off. Mortality rates can be high among those with undeveloped or weakened immune systems, such as the very young, the elderly, chemotherapy patients, AIDS patients and transplant recipients.

In this project, the team will be studying viruses 100 times smaller than crypto — organisms which could more easily pass through some water-treatment technology.

The study will also help gauge performance of new water treatment technologies, which are becoming increasingly sophisticated. Those methods include dissolved air flotation and microfiltration. These treatments are more effective and more costly.

The crypto threat has driven a public willingness to pay for better and safer technologies, Harrington says. Kenosha is installing a microfiltration system for city water, and Milwaukee is upgrading its filters and installing ozonation.

Harrington emphasized that U.S. water-treatment standards are very good, and that drinking water is generally quite safe. Water utilities are required to have a multi-barrier approach to water treatment, where more than one technology is used to remove microorganisms.

"We could look at thousands of water samples before finding anything to worry about," he says. "But the consequences of failing to remove pathogens can be very large. We want to ensure there is minimal risk of public exposure." ■

Virtual reality expert to speak April 23

Brian Mattmiller

An internationally renowned virtual reality expert will discuss work underway to allow people at distant sites to communicate and cooperate on complex tasks, while sharing a realistic "virtual environment."

Jaron Lanier, lead scientist of the National Tele-Immersion Initiative, will speak on April 23, 4-5 p.m. in AB20 Weeks Hall. He will give the annual J. Barkley Rosser Memorial Lecture, which is sponsored by the computer sciences department and made possible through a gift of Annetta Rosser. The event is free and open to the public.

Lanier is a computer scientist, composer, recording artist, visual artist and author. He coined the term "virtual reality," and pioneered the scientific, engineering and commercial aspects of the field.

Lanier will describe ongoing work in the new field of "tele-immersion," a dramatic advance in virtual reality technology that will provide a test application for Internet2. Tele-immersion differs from prior efforts in virtual reality in that it opens up the possibility of photo-realistic human representations or "avatars" as well as an unprecedented integration of physical and virtual objects. Early applications will be in teleconferencing, computer assisted design and medicine.

The lecture series is held in memory of the late Professor Rosser, a UW-Madison professor of computer sciences and mathematics and director of the Mathematics Research Center from 1963 to 1978.

For more information, contact Laura Cuccia, 262-0017. ■

Illustration by Brian Strassburg

Refrigerators in space

UW team crafts a cooler to study X-rays

Russell Hall
Space Science and Engineering Center

Building space-flight hardware sounds pretty glamorous to a lot of us: working with state-of-the-art equipment to create instruments that will fly in outer space, enhancing humankind's understanding of the universe. But when you get down to the nitty gritty, it can be far less so.

Ask Tony Wendricks about spending an evening in a Chicago motel room spreading wires so they could be properly plated. Ask Dave Jones about threading those same wires, 1,600 of them, one by one through a tiny grid. Wendricks and Jones work in the not-so-glamorous trenches of a project in the Space Science and Engineering Center, building a high-tech refrigerator of sorts that will fly on a satellite gathering information about X-rays from outer space.

The project has been daunting from the start. When the group, which also includes Mike Dean and Mark Mulligan, first met with the principal investigator, Dan McCammon of the physics department, Wendricks remembers thinking, "Can we even do this?" The refrigerator uses a magnetic field and salt crystals to cool gold wires, which had to be strung, without touching each other, in a container the size of a soda can.

The hardware, known as the Adiabatic Demagnetization Refrigerator, will fly on the Astro-E satellite, a joint Japanese-NASA X-ray astronomy project. The refrigerator will be used to cool one of the satellite's X-ray detectors to almost absolute zero. By keeping the detector's temperature low, the heat generated by a single X-ray photon can be detected and measured, which can lend insights into black holes, white dwarves, supernovas and a myriad other phenomena.

The refrigerator cools by manipulating the magnetic alignment of the salt crystal molecules with a large magnet. The satellite detector will connect to the crystals using gold wire and gold-plated rods, which will enable the device to cool the detector to 0.065 degrees Kelvin.

The team had to figure out how to keep the apparatus from being eaten away by the corrosive soup needed to form salt crystals. Only gold and stainless steel could stand up to the sulfuric-acid-based solution. After much trial and error, the team finally hit on a way to string the 1,600 gold wires using a perforated disk, which looks like a piece cut from a colander.

Construction brought other problems: A $4,000 spool of gold wire proved not to have the conductivity needed. The first try at heating the wires resulted in their clumping together. "They stuck together like a plate of overcooked spaghetti," says Jones. Gold wire isn't the kind of thing that you throw in the trash, so Wendricks and Jones painstakingly peeled the strands apart using tweezers.

Wendricks also spent an evening spreading apart the wires, which turned out to be too tightly bunched to allow their soldered connections to the apparatus to be gold-plated. Once a Chicago gold-plater had done that, the wires had to be installed on the refrigerator, a process that involved stringing the wires with tweezers through two disks on the unit — as Jones says, like "threading 1,600 needles ... twice."

Now Wendricks and Jones are growing salt crystals, which requires pouring a solution of ground salt crystals and sulfuric acid into the refrigerator "can" four times a day, including a pour at 6 a.m. and one at midnight. It will take a week to two weeks to accumulate the crystals into a tiny salt pill.

Once the salt crystals are grown, the refrigerator will be tested by UW's space physics department before heading to NASA's Goddard Space Flight Center for more testing. Eventually, it will end up in Japan where the launch of the Astro-E is planned for the year 2000.

When it finally gets to space, the product of the UW team's labor will keep the detector operating smoothly for at least two years. ■

- The L&S Policy Group and General Deans Staff, administered by Assistant Dean Christopher Lee, develops college policy and interprets it to students.
- The Enrichment Group, responsible for a wide array of programs to deepen, strengthen and enhance the undergraduate educational experience, includes undergraduate research and honors opportunities, diversity programs for students of color and others, leadership training for students, mentor matching and more. Coordinators for the group are Assistant Dean Consuelo Lopez Springfield and classified Supervisor Debby Bushey.

"We think this new structure is more coherent and understandable," says Letters and Science Associate Dean Judi Roller. The college will evaluate the effectiveness of the new organization in coming months.

NOTABLE

Graduation features Abrahamson

Shirley S. Abrahamson, Wisconsin Supreme Court chief justice since 1996, will address midyear graduates as they commemorate the university's last commencement before 2000.

About 2,500 students will be eligible to participate in the two ceremonies in the Kohl Center:

- All Ph.D., M.F.A., master's and professional degree candidates, and bachelor's degree candidates in agriculture, education, human ecology, and nursing should attend the ceremony at 1 p.m.
- Bachelor's degree candidates in business, engineering and letters and science will celebrate their graduation at 4 p.m.

"The Kohl Center is a superb venue to celebrate the accomplishments of our graduates who are now poised to address the many challenges of the twenty-first century," says David Musolf, secretary of the faculty.

Chief Justice Abrahamson, who earned her doctor of juridical science degree from the UW Law School, will speak at both ceremonies. She has served on the Wisconsin Supreme Court since 1976.

No tickets are required. For more information: Commencement Hotline, 262-9076.

University reaccredited

As expected, the university has been reaccredited by the North Central Association of Colleges and Schools. The NCA Nov. 19 approved the university's reaccreditation through 2008-09. The university was last accredited in 1989 and has been continuously accredited since 1913.

The 1989 reaccreditation and university self-study led to the "Future Directions" report, which Chancellor David Ward used in part to formulate "A Vision for the Future," an updated strategic plan, in 1995.

The 1999 self study, along with the NCA evaluation team's report and the "Vision" document, will form the basis for future strategic planning at the university. Information: Joseph Wiesenfarth, 263-9233, or visit: http://www.wisc.edu/newdirections/.

System's Ward to retire

David J. Ward, UW System senior vice president for academic and student affairs, plans to step down from that position in July. Ward has served in the post since 1994, after serving as vice chancellor for academic affairs, deputy to the chancellor and acting chancellor at UW-Oshkosh. He had served on the faculty at UW-Oshkosh since 1976, and had chaired UW-Oshkosh's Department of Finance and Business Law. "Serving in System Administration has been a capstone to my 31 years of service to the University of Wisconsin System," Ward says.

UPDATE

Fluno Center on schedule

The Fluno Center for Executive Education is on schedule to open on campus in March. The eight-story building, 601 University Ave., will host university-related programs and events for units from across campus.

Ted Beck, associate dean for executive education at the School of Business, says, "Although the Fluno Center was created though the initiative of the business school, we recognized that other schools and departments on campus would want to make use of this world-class facility for their programs. It was developed as a campus resource."

The $24 million Fluno Center contains 100 residence rooms, four classrooms, a 150-seat auditorium, a fitness center and dining room. The facility is being built with a combination of private funding and is owned and operated by the Center for Advanced Studies in Business Inc., a nonprofit organization that supports the School of Business. Information: 262-9788.

Still time to be a partner in giving

The seven-week State, University and UWHC Employees Combined Campaign of Dane County officially ended Nov. 30, but there is still time to help the campaign reach its 1999 goal.

Late contributions will be accepted, and those made between now and Jan. 31, 2000, will be credited to the 1999 SECC campaign. However, if you wish to contribute by payroll deduction and want your deductions to begin in January, you should turn in your pledge form before Wednesday, Dec. 15.

To date, the annual charity fund-raising drive has raised $1,753,739, or 80 percent of the $2,200,000 goal set by its administrative board.

On the university side, 2,737 employees have contributed $649,898, with an average gift of $237.44. On the state side, 6,354 employees have contributed $1,067,339, with an average gift of $167.97.

Hospital treats HIV patients

Using a three-year, $1.2 million grant, UW Hospital and Clinics in the past year has treated 103 HIV-positive individuals who do not have adequate health insurance.

The grant, know as the Ryan White Title III program, provides HIV treatment and comprehensive health care from a team of specialty physicians, nurses, pharmacists, social workers and dieticians.

Primary care services under the program include diagnosis and treatment of HIV disease, early intervention and prevention of HIV-related complications, general medical care, referrals to specialty clinics and screening for clinical trials.

The Ryan White program, is named in honor of an Indiana teen-ager who died of AIDS in 1990 at age 19. An estimated 4,000 HIV-infected individuals live in Wisconsin, and the program expects to enroll up to 100 patients a year. Information: 263-9346.

MILESTONES

Former L&S associate dean dies

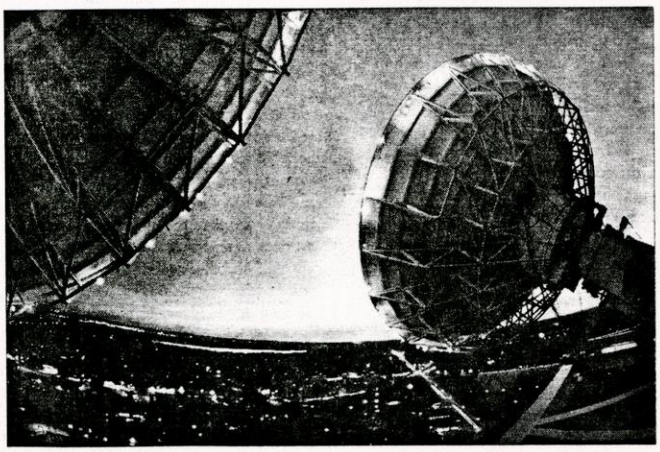
Yvonne Ozzello, 66, former associate dean in the College of Letters and Science, died of cancer Nov. 19.

Ozzello, a native of Versailles, France, came to the university in 1969 for doctoral work. She began teaching in the UW-Madison Department of French and Italian as a lecturer in 1970 and rose to the rank of full professor in 1988. In that year she also received the Chancellor's Distinguished Teaching Award. In 1996 the French government commended her for advancing French culture in the United States.

Ozzello chaired the Department of French and Italian between 1988 and 1992. In 1994 she became associate dean with responsibility for the humanities in the College of Letters and Science, a position she held until she retired in 1998.

A memorial mass was held Nov. 23.

Recent sightings by Jeff Miller: Holiday dishes



Trimmed with holiday lights, the two big satellite dishes atop the Atmospheric, Oceanic and Space Sciences Building transmit holiday cheer. The glowing gift to the community is an annual effort by the Space Science and Engineering Center staff. SSEC staff member Matthew Lazzara first envisioned the idea during a holiday party committee meeting in 1994. The committee bought the bulbs using private money.

ALMANAC

Almanac lists facts, figures, resources and miscellany of campus interest. Know something or want to know? Call us: 262-3846, or e-mail: wisweek@news.wisc.edu.

Composer's work to premiere

The premiere of a commissioned musical work by Scottish-born composer **Thea Musgrave** will help the School of Music seal the century — and campus sesquicentennial — at a free concert Friday, Dec. 10, at 8 p.m. in Mills Concert Hall.

Musgrave chose the John Dryden poem, "Song for St. Cecilia's Day" as the inspiration for her new "Celebration." The birthday of St. Cecilia, patron saint of music, is celebrated in December, and the piece was commissioned for another celebration, the UW-Madison Sesquicentennial.

The Chamber Orchestra and Concert Choir will debut the new piece, "Celebration," under the guest direction of music professor **Beverly Taylor**. Works by Respighi, Fauré and Copland will be directed by Chamber Orchestra conductor **David Becker**.

Hospital traffic rerouted

Expansion projects will change traffic patterns outside UW Hospital and Clinics. Because the construction site will occupy both lanes of traffic between the front of the hospital and the parking ramp next to it, all auto and pedestrian traffic will be routed through the front of the parking ramp to a drop-off area near the main entrance. The clinics entrance will be closed for the majority of the project, which is expected to last for the next two years. The hospital is expanding its pediatric intensive care unit at UW Children's Hospital and adding new operating rooms.

Retirements feted

A celebration for **Tom Sailor**, retiring after 15 years as director of Purchasing Services, will be Thursday, Dec. 9, from 3-5 p.m. at the Kohl Center. A similar event is planned for **Peg Geisler**, director of the Office of Outreach Development, Thursday, Jan. 27, from 4-5:30 p.m. in the Virginia Harrison Parlor of Lathrop Hall, 1500 University Ave.

On the calendar

The UW System **Board of Regents** holds its regular monthly meeting at 9 a.m. Friday, Dec. 10, on the 18th floor of Van Hise Hall. Routine business is scheduled.

Shakashiri sells out

All of the free tickets have been given away for the four scheduled programs of "Once Upon A Christmas Cheery in the Lab of Shakhashiri," the ever-popular holiday lectures of **Bassam Shakhashiri** set for this weekend Dec. 11-12.

The real X-files?

Author and UFO expert **Don Schmitt** will speak about the mystery surrounding the alleged crash of an extraterrestrial vehicle near Roswell, N.M., and the existence of alien life at 7 p.m., Wednesday, Dec. 8, Room 109 Union South.

Backward glance

From Wisconsin Week, Dec. 15, 1989: The Faculty Senate votes to ask the Board of Regents to expel ROTC from campus because the program discriminates against gays and lesbians. ... The university unveils plans to convert the Red Gym into "a front door to campus," providing services to students and visitors. ... **Frederic Cassidy**, still working on the Dictionary of American Regional English, celebrates a half-century on the university faculty.

Quotable

"It was partly because of the beauty queen thing."

— Kim Santiago, explaining her varied background

(see page 4 for full story)

RESEARCH DIGEST

ENVIRONMENTAL STUDY TAKES A LEAP INTO ORBIT

In July of this year, if all goes according to plan, the first of NASA's Earth Observing Satellites (EOS) will sweep into a polar orbit 900 miles above the Earth. Aboard will be MODIS, the Moderate-Resolution Imaging Spectroradiometer, a device whose capabilities are now being tested at UW-Madison's Space Science and Engineering Center.

MODIS will enable scientists to study such things as ocean currents, clouds and land formations from space. Measuring clouds and the energy they reflect back into space or help trap in the atmosphere, for example, is an essential element in the study of climate change and global warming. MODIS will provide a new long-term record, in unprecedented detail, of such phenomena.

RENEWABLE ENERGY: ON THE CUSP OF RENEWAL?

Whatever happened to solar power? After a burst of interest in the 1970s, solar energy applications have never reached more than a fraction of their potential in America.

William Beckman, director of the Solar Energy Laboratory, says the relative cheapness of fossil fuels through the 1980s and '90s has reduced interest in renewable energy sources. But it shouldn't: Beckman says that increasing solar usage could have a greater impact on reversing global warming than almost any other remedy.

For example, Beckman says a third of the country uses electricity for home water heaters. If those homes switched to a combination electric-solar water heating source, it would result in more carbon dioxide-reduction than doubling the gas mileage of every American car.

KEEPING AN EYE ON THE MERCURY

The Water Chemistry Program is studying why some watersheds are more vulnerable than others to mercury contamination. The research team is comparing notes from two diverse landscapes: Rivers of the Lake Superior Basin and the Florida Everglades.

Program director David Armstrong says researchers are finding that watersheds with high proportions of wetlands and forest tend to be more vulnerable to mercury moving downstream. In the Everglades, they are studying how management practices affect mercury's accumulation in the food chain. Mercury pollution, primarily from burning fossil fuels and deposited by air onto the landscape, has been linked to neurological problems and is frequently cited in fish advisories.

GETTING INDUSTRIAL WASTE OUT OF THE LANDFILL

Heavy industry generates millions of tons of solid waste every year, and campus engineers would like to keep it out of already-swelling landfills.

A group of civil engineers has recently created the Beneficial Reuse Program, a research campaign designed to find alternative uses for foundry sand, fly ash, reclaimed pavement, shredded tires and paper sludge – most of which gets entombed in landfills.

Civil engineer Craig Benson says dumping industrial waste in landfills is very costly. But the waste makes good, cheap and abundant materials for the construction and transportation industries. For example, the university researchers found that foundry sand makes effective barriers for landfills, embankments and retaining walls for highways, and supplements for asphalt. They are also exploring road construction uses for shredded tires and plastic.

Calling the microbial cavalry

Plants found to use genes to recruit help from friendly microorganisms

Terry Devitt

In the battle against the legions of lethal soil pathogens that beset crops, plants, apparently, have the ability to summon the microbial cavalry.

Scientists have long known that beneficial soil microorganisms tend to flock to plant roots — along with their detrimental bacterial and fungal counterparts. But they've never known how.

Now university scientists, writing in the current issue of the Proceedings of the National Academy of Sciences, report that the ability to call for help is genetically wired into plants. The finding chips away at a fundamental mystery of symbiotic behavior and suggests that through careful breeding, the battle against devastating soil microbes can be turned.

Photo by Jeff Miller

Robert M. Goodman, left, professor of plant pathology, and graduate student Marek Sliwinski examine tomato plants growing at the climate-controlled Biotron research center.

"We now have genetic evidence that plants contribute significantly" to the activity of beneficial soil microorganisms, says Robert M. Goodman, plant pathology professor and co-author of the paper. "Genes somehow play a role in terms of what kinds of microbes are recruited."

The work suggests that the tools are now available to breed plants that are good hosts for beneficial microorganisms.

Soil is host to a zoo of microorganisms, some good and some bad. Soil pathogens — bacteria, fungi and other microbes — infect nearly all cultivated plants, reducing yields and in some instances wiping out entire crops.

More recently, chemical pesticides have been used to successfully control such blights. But microbes may develop resistance to the chemical agents, which also pose the threat of pollution to ground water and soil. By finding that plants themselves have the ability to recruit microbes that combat other disease-causing organisms, scientists have opened a new front in a battle that is as old as agriculture.

"This work is a start," says Goodman. More discoveries could enable plant breeders to create plants that act as magnets not only for disease-fighting microbes, but also for other beneficial microorganisms such as nitrogen-fixing bacteria.

The problem of how microbes of all kinds are drawn to the roots of plants is an old one, says Goodman. "What we are no longer ignoring is the contribution of the plant to these associations," he says.

The discovery was made using an experimental population of plants derived from a cross between a cultivated tomato and a related wild species to create plants with varying genetic abilities. Those plants were then exposed to a pathogen that causes seed and seedling diseases, and then to a disease-suppressing bacterium known as UW85. The Wisconsin team observed that the combined effects of several tomato genes contributed to the ability of plants to support populations of the disease-thwarting UW85 bacterium.

The catch, says Goodman, is that while the team was able to demonstrate the influence of genes and roughly locate where those genes lie on tomato chromosomes, more work is needed to precisely identify the genes involved and find out exactly what they do to attract good microbes.

It is likely, Goodman explaines, that there are a number of genes at work and that they initiate a chain of biochemical communication that somehow signals microbes and draws them to the plants. Other factors, such as the physical features of plant roots, probably play a role as well.

Goodman and co-authors Kevin P. Smith, now on the faculty at the University of Minnesota, and Jo Handelsman, a UW-Madison professor of plant pathology, are now extending the research to corn. ■

Professor explores science, politics of dams

Brian Mattmiller

Love 'em or hate 'em, there is one indisputable fact about dams in America: Thousands of them are aging, obsolete and dangerous, and await either a repair bill or a wrecking ball.

In towns across the country, the emotional question of whether a dam is a community asset or an environmental scourge will be frequently debated in coming years. But a university ecologist hopes to ground the question on a sound scientific footing.

Emily Stanley, an assistant professor of zoology and scientist with the Center for Limnology, plans to use a dam removal project on Wisconsin's Baraboo River as a unique opportunity to gather important ecological data before and after the breach.

Surprisingly, Stanley says, there is little detailed scientific information about dam removal and all of the cascading effects it creates on water quality, landscapes, fish and wildlife. The Baraboo River could serve as a national model for biologists of how rivers respond to this great unleashing of their currents.

An aging dam on the upper Baraboo River in LaValle is scheduled for removal in 2001. The Sand County Foundation, a regional environmental group, purchased an option on the dam and is leading removal plans, along with the Wisconsin Department of Natural Resources.

The Baraboo River will be a particularly compelling case study, Stanley says, because the river faces three dam removals. After LaValle, another two dams are expected to be removed in the city of Baraboo. In addition, two dams were removed earlier, one in the 1970s and one just two years ago.

"We can look at changes with respect to the entire river basin," she says.

Among the questions: Will native plants, trees and wetlands return to the land that was underwater? Will the flushing of sediment reintroduce some agricultural chemicals that compromise water quality? Will the aquatic food chain look completely different before and after the dam? Will river-dependent species of fish make a comeback, and what species will they replace?

"One thing people would love to see in the Baraboo is sturgeon running again," Stanley says. "The area in downtown Baraboo was an historically important sturgeon breeding area."

But some potential losses would need to be prevented by the project. For example, the mill pond currently attracts great bird populations, including a pair of nesting bald eagles, she says.

On a national scale, dam removal is being driven by economic and legal reasons, Stanley says. Most dams were built between 1860 and the 1920s and have a life expectancy of about 100 years. As inspections turn up safety problems, some towns are faced with six-figure price tags for repairs. The DNR says 30 dams may be razed in the next five years alone.

Economics aside, many environmental groups are taking this opportunity to push dam removal as a national priority.

"There is a campaign to return rivers to what they ought to be, which is a free-flowing water course, to get native fish back in, to circulate the water and flush out the sediment," she says. "This is what rivers do, they flow through channels and don't get stuck behind dams."

Yet many residents use and appreciate the impoundments created by dams. Removing them may leave homes along the quiet, glassy waters high and dry, and some recreational opportunities may be lost.

Stanley says she believes baseline scientific information will be useful to all the stakeholders in these debates. And it could give land managers "a potentially powerful tool for river restoration." ■

Space ? Space Sci + Eng. Member

Science Report

Agricultural and Consumer Press Service
440 Henry Mall
Madison WI 53706 (608) 262-1461
Madison

College of Agricultural and Life Sciences
Research Division
University of Wisconsin-

rec. June 25, 1999

For Immediate Release
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WISCONSIN GOES HIGH TECH WITH WEATHER FOR FARMERS

An internet site, linked to a satellite and other weather networks, replaces old ag weather stations

Farmers across the state can visit an internet site to check on the corn borer situation, see if potato late blight is a problem, or find out if they should flood their cranberry bogs. It's all part of a revolution in the way growers get weather and related information.

The internet-based information replaces the old University of Wisconsin Automated Weather Observation Network, according to UW Madison soil scientist Bill Bland. Bland is the architect of Wisconsin's approach, which analyzes data from satellites and federal weather networks in order to create weather-related information for growers.

The weather data are available at **www.soils.wisc.edu/wimnext/**

The site also provides farmers with other information helpful in making decisions about their alfalfa, apple, corn, cranberry and potato crops. The decision aids help farmers monitor the development of several key insects and diseases, and the need for irrigation.

"To produce crops while minimizing pesticides, water pollution and energy use, many Wisconsin farmers are relying on management tools that depend on up-to-the-minute weather data," says Bland, a College of Agricultural and Life Sciences and UW-Extension scientist. "Weather data is the backbone of most integrated pest management and integrated crop management programs."

-more-

Although many other states are expanding their ground-based systems, Wisconsin is pursuing a high-tech approach. Wisconsin's old ag weather network once included 20 stations, but is now down to two stations, at Hancock and Arlington. Information from the old network has been replaced by information from satellites and ground station networks maintained by the National Weather Service and Federal Aviation Administration.

"The internet has made it far easier to compile and move data," Bland says. For example, he says, the National Weather Service collects data from weather balloons it sends aloft every morning about 7 a.m. That information is received and assembled in Washington D.C. Computers at the UW-Madison Space Science and Engineering Center quickly download that information and route it to Bland's computer, which updates the web site.

"It's all automated," Bland says. "By 11 a.m., when a cranberry grower checks our site, information collected by that morning's balloon flights has been integrated into the frost forecast for that night."

Bland says the site would be impossible without collaborators at the UW-Madison.

"There are only a few universities with the breadth of skills and knowledge to do something like this," he says. "Wisconsin leads the nation in this technology thanks to the work of atmospheric scientist George Diak in the Space Science and Engineering Center, and soil physicist John Norman in our college." Diak developed a computer model that creates high-resolution, 48-hour forecasts. Norman developed a second model that uses Diak's forecasts to predict how the weather will affect crop and pest conditions at the field level.

Although Bland was initially skeptical about farmers having good access to the internet, he has become a convert. He believes there is a trend to provide more web-based information rather than stand-alone software programs for growers' computers. He says growers often have trouble operating software on their computer systems. Growers and their advisors visit his web site about 1,500 times a month during the growing season.

HI-TECH WEATHER – add two

Bland and his associates began the site three years ago. He works closely with researchers in horticulture, entomology and plant pathology to improve the decision aids available to Wisconsin farmers. Each year they expand the web site, adding new features.

While the web site will provide farmers with most of the weather information they need, it's not accurate enough yet to be useful for rainfall. "Rainfall is so patchy that farmers need to put out and monitor their own rain gauges," Bland says.

Information for Wisconsin farmers dominates the web site, although it also provides data that farmers in Minnesota, Michigan and Ohio can use in deciding if they need to irrigate their crops.

The site is a joint effort of the UW-Madison Space Science and Engineering Center, the College of Agricultural and Life Sciences and the UW-Extension Cooperative Extension Service. The project was supported by state funding to the UW-Madison College of Agricultural and Life Sciences and the UW-Madison Graduate School, and grants from the National Aeronautics and Space Administration, the Wisconsin Potato and Vegetable Growers Association, the Wisconsin Cranberry Growers Association and the Minnesota potato industry.

###

High-tech weather 6/99
Writer: George Gallepp (608) 262-3636

Space - SSEC

April 16, 1999

TO: Editors, news directors
FROM: Brian Mattmiller, (608) 262-9772
RE: Tornado Awareness Week

Upredictable, powerful and sudden, few things inspire more terror than a tornado. With severe weather season on the horizon for Wisconsin, Gov. Tommy Thompson has declared April 20-26 as Tornado Awareness Week.

John Mecikalski, a research scientist with the UW-Madison Space Science and Engineering Center, can discuss the scientific and safety issues of tornadoes. He says tornadoes are most likely to occur in Wisconsin in the months of June and July, and the state sees an average of 15 to 16 confirmed tornadoes each year.

The biggest contributor to tornadoes is vertical wind shear, which occurs when two powerful winds from a storm move in different directions. When this shear is close to the ground and creates a clockwise rotation, a "cyclonic rotation," it lays the foundation for twisters. Mecikalski says extreme contrasts in temperature also fuel tornado conditions.

Mecikalski says Wisconsin has two "belts" where tornadoes occur more frequently - from the Twin Cities to the Park Falls area, and from south central Wisconsin to the Fox Valley. More open, agricultural land makes better conditions for smaller tornadoes, Mecikalski says.

But randomness is the rule for tornadoes. "If you spent your graduate thesis trying to calculate when and where tornadoes would strike, you would be frustrated," he says.

Tornadoes kill fewer people each year than floods or lightning, but they can produce awesome devastation. Commonly measured on something called the Fujita scale, most tornadoes are F-0 or F-1, with winds up to 112 mph. About 1 percent of tornadoes each year are F-5, with winds up to 318 mph, and they can destroy everything in their path. The 1987 Barneveld tornado, for example, was an F-5.

For more information, contact Mecikalski at (608) 262-1023; or by e-mail at john.mecikalski@ssec.wisc.edu

Space-
Sec

April 19, 1999

TO: Editors, news directors
FROM: Brian Mattmiller, (608) 262-9772
RE: Earth Day story ideas

With the 29th annual Earth Day coming up Thursday, April 22, environmental issues will be in the national spotlight. Along with local events coverage, reporters might consider some UW-Madison research that focuses on environmentally friendly practices.

o Students show the way with campus green projects
o Wisconsin-style recycling: New uses for cow manure
o Environmental study takes a leap into orbit
o Solar power: Renewable energy on the cusp of renewal?
o Keeping an eye on the mercury
o Measuring the value of Lake Wingra

STUDENTS SHOW THE WAY WITH CAMPUS GREEN PROJECTS

A UW-Madison environmental studies course follows the philosophy that little victories are the route to big changes. The Environmental Studies Certificate Seminar uses the campus as a test bed for small-scale student projects to improve the environment.

Evelyn Howell, a landscape architecture professor and IES 600 instructor, says the class has three solid projects underway this semester. One group is looking at "natural landscape design" as an alternative to manicured lawns on some parts of campus. They have proposed converting a grassy area near Muir Knoll into a native perennial flower garden.

A second project is exploring ways for the UW-Madison food service to buy more dairy products and produce from local farmers. And a third project will study a proposal to pave lakeshore path, and try to determine its impact on path users. There are concerns that pavement, while helping bicyclists, would hurt the solitude of the path.

Since the early 1990s, Howell says IES 600 students have produced dozens of small improvements that have endured on campus. For more information about classes, contact Howell at (608) 263-6964; or by email at eahowell@facstaff.wisc.edu
###

WISCONSIN-STYLE RECYCLING: NEW USES FOR COW MANURE

Aside from an annual cow chip toss, the world hasn't stumbled on too many alternative uses for cow manure. But UW-Madison researchers have a couple new ones: water filters and particle board.

The biological systems engineering scientists are using separated and cleaned fibers from cow manure to make high-quality hardboards. Those fibers also have an uncanny ability to filter heavy metals from water. Richard Koegel, a professor of biological systems engineering, says the researchers use a retaining press on a Prairie du Sac farm to separate the manure fibers from liquid waste. The captured material had been used as bedding for farm animals until the researchers explored new ideas.

They teamed with a Chicago consultant to make steam pressure-treated hardboard from manure fibers. They are also working with Forest Products Laboratory researcher Jim Han, who specializes in creating biofilters to clean up water pollution. Han has installed a system that will use the manure fibers to filter storm water at Mount Horeb's Stewart Lake.

Koegel says odor is removed in the separation process. But whether the public ever catches wind of the material might depend on the wood market, where shortages in wood and paper pulp are predicted.

"People should know the research is preliminary," adds Koegel. "Otherwise, I'll get phone calls from 500 farmers asking where they can drop off their manure."

Koegel can be reached at (608) 264-5149, or rgkoegel@facstaff.wisc.edu; Han at (608) 231-9423.
###

ENVIRONMENTAL STUDY TAKES A LEAP INTO ORBIT

In July of this year, if all goes according to plan, the first of NASA's Earth Observing Satellites (EOS) will sweep into a polar orbit 900 miles above the Earth. Aboard will be MODIS, the Moderate-Resolution Imaging Spectroradiometer, a device whose capabilities are now being tested at UW-Madison's Space Science and Engineering Center.

MODIS will enable scientists to study such things as ocean currents, clouds and land formations from space. Measuring clouds and the energy they reflect back into space or help trap in the atmosphere, for example, is an essential element in the study of climate change and global warming. MODIS will provide a new long-term record, in unprecedented detail, of such phenomena.

To learn more about MODIS and the insight it may provide on issues of climate, contact Paul Menzel at (608) 263-4930, or Steve Ackerman at (608) 263-3647.
###

SOLAR POWER: RENEWABLE ENERGY ON THE CUSP OF RENEWAL?

Whatever happened to solar power? After a burst of interest in the 1970s, solar energy applications have never reached more than a fraction of their potential in America.

William Beckman, director of UW-Madison's Solar Energy Laboratory, says the relative cheapness of fossil fuels through the 1980s and '90s has reduced interest in renewable energy sources. But it shouldn't: Beckman says that increasing solar usage could have a greater impact on reversing global warming than almost any other remedy.

For example, Beckman says a third of the country uses electricity for home water heaters. If those homes switched to a combination electric-solar water heating source, it would produce more carbon dioxide-reduction than it would to double the gas mileage of every American car.

Beckman says the UW's Solar Energy Lab, opened in 1954, is the oldest such center in the country. For more information, contact Beckman at (608)263-1590; or beckman@engr.wisc.edu
###

KEEPING AN EYE ON THE MERCURY

UW-Madison's Water Chemistry Program is studying why some watersheds are more vulnerable than others to mercury contamination. The research team is comparing notes from two diverse landscapes: Rivers of the Lake Superior Basin and the Florida Everglades.

Program director David Armstrong says researchers are finding that watersheds with a high proportions of wetlands and forest tend to be more vulnerable to mercury moving downstream. In the Everglades, they are studying how management practices affect mercury's accumulation in the food chain. Mercury pollution, primarily from burning fossil fuels and deposited by air onto the landscape, has been linked to neurological problems and is a frequent culprit in fish advisories.

For more information, contact Armstrong at (608) 262-0768; or colleague James Hurley at (608) 262-1136.
###

GETTING INDUSTRY WASTE OUT OF THE LANDFILL

Heavy industry generates millions of tons of solid waste every year, and UW-Madison engineers would like to keep it out of already-swelling landfills.

A group of civil engineers has recently created the Beneficial Reuse Program, a research campaign designed to find alternative uses for foundry sand, fly ash, reclaimed pavement, shredded tires and paper sludge–most of which gets entombed in landfills.

Civil engineer Craig Benson says dumping industrial waste in landfills is very costly. But the waste makes good, cheap and abundant materials for the construction and transportation industries. For example, the UW-Madison researchers found that foundry sand makes effective barriers for landfills, embankments and retaining walls for highways, and supplements for asphalt. They are also exploring road construction applications for shredded tires and plastic.

For more information, contact Benson at (608) 262-7242; or doctoral student Tarek Abichou at (608) 262-6281.
###

MEASURING THE VALUE OF LAKE WINGRA

A mere pond compared to its neighbors Mendota and Monona, Madison's Lake Wingra is nonetheless a hot resource for thousands of boaters, anglers and nature lovers. A graduate student project wants to keep it that way by exploring ideas to improve water quality.

The students, part of UW-Madison's Water Resources Management program, are polling residents about their usage of and attitudes toward the lake. They are also looking for a consensus on what management steps to take to improve Wingra.

Kenneth Potter, a civil and environmental engineer who oversees the project, says Wingra is nothing like what it was a century ago. It used to be primarily spring-fed, but now is fed mostly by surface runoff. The change has caused a big increase in sediment and algae blooms. The students will look into new methods to increase groundwater flow and making bank improvements around the lake.

For more information, contact Potter at (608) 262-0040; or student Diane Stocks at (608) 262-8960.
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Space~ SSEC

CAMPUS SCENE

ART AS THERAPY: WORKSHOPS MEANT TO FREE CREATIVITY

Some anthropologists and psychologists suggest that most Americans are creatively anemic, and that artists are viewed as a separate society into which only the anointed few can enter.

However, art therapist Erin Reeves says she believes that artistic discovery is within everyone and merely needs to be nurtured in an open-minded environment. Reeves will present three workshops this spring at Memorial Union. The first, "Creativity: Its Necessity in Our Social and Psychological Well-Being (Beyond the Artist Within) is scheduled for Saturday, Feb. 27, 10 a.m.-12 noon. This workshop will explore current American attitudes and beliefs toward creative activity. Future workshops include: "Women and Art" and "Getting Over Creative Blocks," tentatively scheduled for Saturday, March 20, and Saturday, April 24. The workshops are free, but call in advance to register, 262-7592.

STUDENTS STAGE PLAYS AT MEMORIAL UNION

Three one-act performances highlight the Marcia Binns/Student Play Festival, held Wednesday and Thursday, March 3 and 4, at the Fredric March Play Circle in Memorial Union, at 7:30 p.m. "Bed and Breakfast," directed by Erin Patinkin, examines society's outcasts; "Say Something Intelligent," directed by Vickie Eiden, concerns the interactions of people on an elevator while simultaneously revealing their actual unspoken thoughts and emotions; and "Little Airplanes of the Heart," directed by Becky Raik, focuses on the dreams of a boy and his uncle. The festival, co-sponsored by former UW theater student Marcia Binns and the Performing Arts Committee of the Wisconsin Union Directorate, is free and open to the public. For more information, contact Katrina Pavlik, 256-5075; kapavlik@students.wisc.edu.

GETTING AROUND: LOT 82 ACCESS LIMITED

Due to the major expansion project currently underway at the Waisman Center, the Highland Avenue entry drive to the center's parking lot (Lot 82) has been closed for an extended period of time. For the duration of the project, the only access route to Lot 82 will be from the Nielsen Tennis Stadium drive.

Motorists are being asked to proceed with caution when traveling through Lot 82, as construction equipment and delivery vehicles also use the lot. A revised map, showing transit, parking and access routes, can be found by visiting: http://www.waisman.wisc.edu.

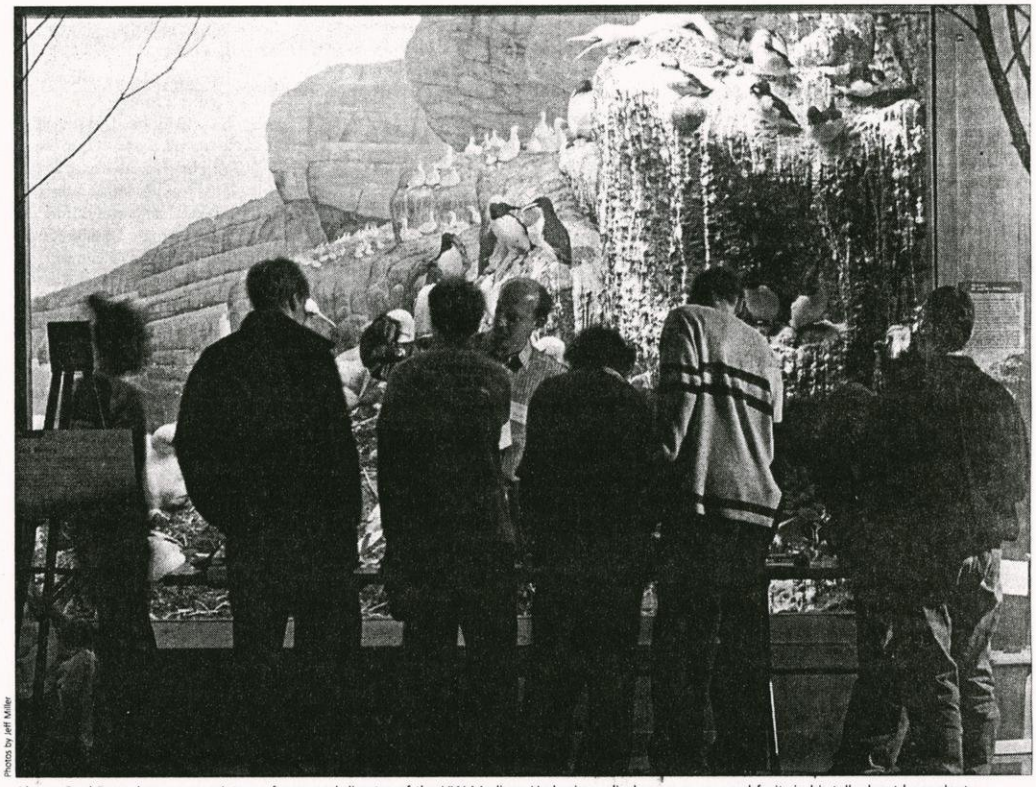
The Waisman project involves construction of a new seven-story addition to the center and a major renovation of the adjacent single-story west wing. The project should be completed by summer 2000.

BACKWARD GLANCE

From Wisconsin Week, Feb. 22, 1989: UW professor Bassam Shakhashiri, in his role as National Science Foundation assistant director, warns of a shortage of a half-million scientists and engineers by 2000. ... A state study has generated interest in building a sports arena on campus. ... The School of Veterinary Medicine is considering taking an advisory role to ensure animal welfare at the state's first dog-racing track. ... Women are twice as likely as men to leave the university before getting tenure, according to a campus study of faculty retention.

Whys and Wows

Faculty, museum team up for a day of discovery



Photos by Jeff Miller

Above: Paul Berry, botany associate professor and director of the UW-Madison Herbarium, displays some unusual fruits in his talk about how plants disperse their seeds by "hitching a ride" on wind, water and animals. Below right: A student examines the gooey results of a DNA-extraction test run by Tom Zinnen, director of the biotechnology outreach program. Below left: Students create food chains during Darrel Covell's wildlife ecology exhibit.

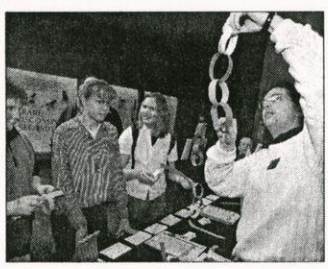
Brian Mattmiller

Amid the recreated rain forests, ancient city streets and Egyptian temples of the Milwaukee Public Museum, about two dozen people brought another exotic world to life: UW research.

"Whys and Wows!," a day of interactive programs sponsored by UW-Madison and the museum, packed the house Tuesday, Feb. 16, with nearly 1,700 Wisconsin school children from 24 school districts. Around nearly every corner, the students found a professor, staff member or student ready to share the excitement of discovery.

The presenters could hardly have been more diverse. African mask-makers shared the floor with Asian dancers, storytellers with snake doctors, and endangered-monkey researchers with exotic fruit collectors.

The rain forest exhibit was a frantic beehive of activity all morning, as biotechnology outreach expert Tom Zinnen showed kids how to extract DNA from a plant. Kids mixed wheat germ, water and green-tinted rubbing alcohol until their quarry — a gooey white glop containing the blueprint of life — floated to the surface.



Zinnen brought 1,500 DNA extraction kits with him that day, and left with his plastic crates bulging with dirty test tubes.

Deeper into the trees was veterinary science assistant professor Joanne Paul-Murphy and two of her friends, a green iguana and a boa constrictor named "Slim." Kids gathered around to timidly touch Slim's scaly skin, and learn all about the strange habits of exotic creatures.

Elaine Prins, a scientist in the Space Science and Engineering Center, showed kids unique computer-generated satellite images of recent fires raging through the forests and grasslands of South America. Literally thousands of fires burn in a single day in the Amazon dry season, which showed up as red points of light in the computer display.

"The interaction was great," Prins says. "I think they were amazed at how many fires there are in South America and the extent of the smoke. It kind of gave them a new perspective on that part of the world."

Anne Lundin, an assistant professor of library science, brought along seven of her graduate students to tell colorful folk tales from different cultures. They included stories of a young woman who played her fiddle with the devil, and a pacifist bull who would rather smell the flowers than fight.

"It was a very exciting experience for my students because they are basically neophytes in the field of storytelling," she says. "They realized that they had to go out there and create an audience. Being young and brave certainly helped."

The museum partnership was one way UW-Madison celebrated its 150th birthday with the citizens of Milwaukee, during a series of "On The Road" events. Other UW-Madison events in Milwaukee include a gala reception Monday, Feb. 15, at the Milwaukee Art Institute; a visit to the Clarke Square Health Center, 1818 W. National Ave., a neighborhood-based clinic staffed by the Medical School; and visits to schools and civic and business groups. ■

Next, UW-Madison and UW-Fox Valley are teaming up Tuesday, March 9, 4-7 p.m., for a stellar evening of presentations at the Barlow Planetarium in Menasha. The family-oriented presentations will include UW-Madison work on the famous meteorite being studied for evidence of life on Mars. Another presentation will explore some of the great scientists in Wisconsin history, and a third workshop will dazzle visitors with demonstrations of loud and brilliant chemical reactions.

Space-SSEC

uw news

From the University of Wisconsin-Madison / News Service, Bascom Hall, 500 Lincoln Drive, Madison 53706 / Telephone: 608/262-3571

Release: Immediately 10/9/86

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SCIENCE/METEOROLOGY:
A small army of scientists is set to begin a massive three-week study of Wisconsin cirrus clouds using a version of the former U-2 spy plane and portable laser-driven radars. The project is the brainchild of pioneering UW-Madison space scientist Verner Suomi. 635 words

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CONTACT: Don Wylie (608) 263-7458

SCIENTISTS TO PUT WISCONSIN'S CLOUDS UNDER A MICROSCOPE

By TERRY DEVITT
University News Service

MADISON--Picture the following:

Satellite eyes zoom in on Wisconsin cloud cover. A NASA ER-2 -- a high-flying, long-winged aircraft packed with sophisticated meteorological gear -- soars aloft from Madison's Truax Field. Scientists in Oshkosh and Wausau deploy and aim portable laser-driven radars toward the heavens.

That scenario will become reality this week (Oct. 12) as scientists from around the country arrive in Wisconsin to begin an intensive three-week field study of cirrus clouds, feather-shaped streamers that play an important role in determining climate.

"We're trying to build tools to predict climate," said Don Wylie, a University of Wisconsin-Madison Space Science and Engineering Center scientist and an assistant manager for the project.

"You hear a lot about the greenhouse effect and the potential for climate change from things like volcanic eruptions," Wylie said, "but over the long-term, clouds play a far more important climatological role than any of

-more-

those other things."

The brainchild of UW-Madison's pioneering space and weather researcher Verner Suomi and Francis Bretherton of the National Center for Atmospheric Research in Boulder, Colo., the project is known as FIRE, a much shortened version of First International Satellite Cloud Climatology Program Regional Experiment. It is being directed by Steven Cox, a Colorado State professor and former student of Suomi's.

Some 40 scientists and a small army of technicians, support personnel and students from 10 universities and federal agencies will take part in the study.

They will employ the ER-2, a version of the former U-2 spy plane. The ER-2, equipped with infrared sensors and other gear designed to sample cirrus clouds, will crisscross the southern half of Wisconsin at altitudes as high as 70,000 feet.

According to Wylie, there will be at least two other aircraft equipped with sensors and particle samplers involved in the cloud survey. In addition, at least four weather satellites will contribute information during the course of the FIRE field survey.

In Oshkosh, Wausau and Madison scientists will deploy laser-driven radar known as LIDAR. By firing laser pulses at cirrus clouds and monitoring the reflection, much as radar operators monitor echoes produced by radio waves, scientists can determine such things as cloud height and density.

Why all this interest in cirrus clouds?

"There are two big problems in climatology," said Suomi. "One is the effect of oceans on climate and the other is the effect of clouds on climate."

The clouds scientists think might be the most important in determining climate are cirrus clouds, the type to be studied in the upcoming FIRE field survey, and marine stratus clouds, low clouds that form in layers over the ocean and that usually cover a large area of sky.

Add 2--Clouds

Marine stratus clouds will be the subject of a second intensive FIRE field survey next summer off the coast of southern California.

The two types of clouds are important to climate because they cover an estimated 70 percent of the Earth's surface. And although both cloud types play an important role in determining climate, they do so for different reasons, according to Wylie.

"Cirrus clouds can do the same thing as the so-called greenhouse effect," Wylie said. "They're thin clouds that let sunlight through, yet they act like a blanket and trap infrared radiation emitted by the Earth. Marine stratus, on the other hand, reflect sunlight and because they're low in the atmosphere they become very warm and emit infrared radiation to space."

According to Suomi, the two principal goals of FIRE are to learn more about the effect of cirrus and marine stratus clouds on the Earth's radiation budget and also how those two types of clouds form and decay.

"We have an almost trivial understanding of cirrus clouds," Suomi said. "We need a basic understanding of cloud system evolution and their radiative properties. We need that understanding to improve our weather and climate prediction models."

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-- Terry Devitt (608) 262-8282

UW scientists seek early warning of water threats

Brian Mattmiller

A UW-Madison research team will be mixing up a batch of "pathogen cocktails" in the laboratory, with the goal of countering disease-causing threats to drinking water.

Civil Engineering Professor Greg Harrington is leading a two-year project to determine how well water-treatment technologies remove *Cryptosporidium* and other microorganisms before they reach the kitchen tap.

The $250,000 project is funded by the U.S. Environmental Protection Agency and the American Water Works Association Research Foundation, an international nonprofit group devoted to drinking-water quality. Joining Harrington in the project will be Jon Standridge and David Battigelli, scientists at the Wisconsin State Laboratory of Hygiene.

"If we revie waterborne outbreaks of infectious disease in the United States, we find that the culprit was identified in only about half the cases," says Harrington. "There are numerous microorganisms, but detection methods are available for only a small fraction."

This project will focus on a half-dozen pathogens of future concern as a health threat in drinking water, he said. After growing pathogens in the lab, the researchers will add the pathogen-spiked "cocktails" to drinking water treatment systems to evaluate the ability of different treatment techniques to remove the bugs.

The two pathogens of greatest concern since 1980 have been *Giardia* and *Cryptosporidium*, and both have caused major health threats in the United States. The most serious was the 1993 *Cryptosporidium* outbreak in Milwaukee, in which 69 people died of complications arising from the outbreak.

Harrington's team will take a forward-looking view: Is there another emerging pathogen on the horizon that could unexpectedly threaten public health, in the same way crypto has in the past decade?

"*Cryptosporidium* is not the only microorganism of concern in drinking water," says Battigelli. "Although crypto has been the industry buzzword since 1993, we are finding other microorganisms which may also pose substantial risks to public health if left unaddressed."

There is reason to suspect a "new crypto" could be lurking, Harrington says. Since scientists have only recently been able to accurately detect many of the waterborne pathogens that cause illness, some newly identified types may have been causing low levels of disease for years.

That's true of several pathogens in the study. A class of viruses called caliciviruses has been traced to recent waterborne outbreaks in the United States. The bacterium *Escherichia coli 0157:H7*, has caused at least two waterborne outbreaks that affected more than 300 people. In North and South America, the parasite *Cyclospora* has caused serious health problems.

Battigelli noted that medical treatment is not available for some diseases caused by these pathogens. In many cases, people rely exclusively on their body's immune system to fight them off. Mortality rates can be high among those with undeveloped or weakened immune systems, such as the very young, the elderly, chemotherapy patients, AIDS patients and transplant recipients.

In this project, the team will be studying viruses 100 times smaller than crypto — organisms which could more easily pass through some water-treatment technology.

The study will also help gauge performance of new water treatment technologies, which are becoming increasingly sophisticated. Those methods include dissolved air flotation and microfiltration. These treatments are more effective and more costly.

The crypto threat has driven a public willingness to pay for better and safer technologies, Harrington says. Kenosha is installing a microfiltration system for city water, and Milwaukee is upgrading its filters and installing ozonation.

Harrington emphasized that U.S. water-treatment standards are very good, and that drinking water is generally quite safe. Water utilities are required to have a multi-barrier approach to water treatment, where more than one technology is used to remove microorganisms.

"We could look at thousands of water samples before finding anything to worry about," he says. "But the consequences of failing to remove pathogens can be very large. We want to ensure there is minimal risk of public exposure." ■

Virtual reality expert to speak April 23

Brian Mattmiller

An internationally renowned virtual reality expert will discuss work underway to allow people at distant sites to communicate and cooperate on complex tasks, while sharing a realistic "virtual environment."

Jaron Lanier, lead scientist of the National Tele-Immersion Initiative, will speak on April 23, 4-5 p.m. in AB20 Weeks Hall. He will give the annual J. Barkley Rosser Memorial Lecture, which is sponsored by the computer sciences department and made possible through a gift of Annetta Rosser. The event is free and open to the public.

Lanier is a computer scientist, composer, recording artist, visual artist and author. He coined the term "virtual reality," and pioneered the scientific, engineering and commercial aspects of the field.

Lanier will describe ongoing work in the new field of "tele-immersion," a dramatic advance in virtual reality technology that will provide a test application for Internet2. Tele-immersion differs from prior efforts in virtual reality in that it opens up the possibility of photo-realistic human representations or "avatars" as well as an unprecedented integration of physical and virtual objects. Early applications will be in teleconferencing, computer assisted design and medicine.

The lecture series is held in memory of the late Professor Rosser, a UW-Madison professor of computer sciences and mathematics and director of the Mathematics Research Center from 1963 to 1978.

For more information, contact Laura Cuccia, 262-0017. ■

Illustration by Brian Strassburg

Refrigerators in space

UW team crafts a cooler to study X-rays

Russell Hall
Space Science and Engineering Center

Building space-flight hardware sounds pretty glamorous to a lot of us: working with state-of-the-art equipment to create instruments that will fly in outer space, enhancing humankind's understanding of the universe. But when you get down to the nitty gritty, it can be far less so.

Ask Tony Wendricks about spending an evening in a Chicago motel room spreading wires so they could be properly plated. Ask Dave Jones about threading those same wires, 1,600 of them, one by one through a tiny grid. Wendricks and Jones work in the not-so-glamorous trenches of a project in the Space Science and Engineering Center, building a high-tech refrigerator of sorts that will fly on a satellite gathering information about X-rays from outer space.

The project has been daunting from the start. When the group, which also includes Mike Dean and Mark Mulligan, first met with the principal investigator, Dan McCammon of the physics department, Wendricks remembers thinking, "Can we even do this?" The refrigerator uses a magnetic field and salt crystals to cool gold wires, which had to be strung, without touching each other, in a container the size of a soda can.

The hardware, known as the Adiabatic Demagnetization Refrigerator, will fly on the Astro-E satellite, a joint Japanese-NASA X-ray astronomy project. The refrigerator will be used to cool one of the satellite's X-ray detectors to almost absolute zero. By keeping the detector's temperature low, the heat generated by a single X-ray photon can be detected and measured, which can lend insights into black holes, white dwarves, supernovas and a myriad other phenomena.

The refrigerator cools by manipulating the magnetic alignment of the salt crystal molecules with a large magnet. The satellite detector will connect to the crystals using gold wire and gold-plated rods, which will enable the device to cool the detector to 0.065 degrees Kelvin.

The team had to figure out how to keep the apparatus from being eaten away by the corrosive soup needed to form salt crystals. Only gold and stainless steel could stand up to the sulfuric-acid-based solution. After much trial and error, the team finally hit on a way to string the 1,600 gold wires using a perforated disk, which looks like a piece cut from a colander.

Construction brought other problems: A $4,000 spool of gold wire proved not to have the conductivity needed. The first try at heating the wires resulted in their clumping together. "They stuck together like a plate of overcooked spaghetti," says Jones. Gold wire isn't the kind of thing that you throw in the trash, so Wendricks and Jones painstakingly peeled the strands apart using tweezers.

Wendricks also spent an evening spreading apart the wires, which turned out to be too tightly bunched to allow their soldered connections to the apparatus to be gold-plated. Once a Chicago gold-plater had done that, the wires had to be installed on the refrigerator, a process that involved stringing the wires with tweezers through two disks on the unit — as Jones says, like "threading 1,600 needles ... twice."

Now Wendricks and Jones are growing salt crystals, which requires pouring a solution of ground salt crystals and sulfuric acid into the refrigerator "can" four times a day, including a pour at 6 a.m. and one at midnight. It will take a week to two weeks to accumulate the crystals into a tiny salt pill.

Once the salt crystals are grown, the refrigerator will be tested by UW's space physics department before heading to NASA's Goddard Space Flight Center for more testing. Eventually, it will end up in Japan where the launch of the Astro-E is planned for the year 2000.

When it finally gets to space, the product of the UW team's labor will keep the detector operating smoothly for at least two years. ■

Space — Space Sci + Engineering

FOR IMMEDIATE RELEASE 1/23/98
CONTACT: Rosalyn Pertzborn, 265-4160; Sanjay Limaye, 262-9541

OUT-OF-THIS-WORLD EXPERIENCE FOR MIDDLE SCHOOL STUDENTS

MADISON - With the successful launch of the Space Shuttle Endeavour Thursday evening (Jan. 22) for its docking and transfer mission, it carries into space a camera that takes pictures of unique geographical areas on Earth. On Earth, 7th and 8th graders will activate the camera and focus on these special areas to learn more about them.

Only two Midwest schools, Madison middle schools Velma Hamilton and Spring Harbor, are taking part in this EarthKAM mission. EarthKAM stands for Earth Knowledge Acquired by Middle schools. Scientist Sanjay Limaye and Outreach Coordinator Rosalyn Pertzborn of UW-Madison's Space Science and Engineering Center are shepherding schools from setup through completion of the STS-89 EarthKAM flight. James Kotoski, a seventh-grade science teacher at Spring Harbor is the lead teacher; Julie DeWitt, Learning Coordinator at Hamilton, works with the students at her school.

Earlier in January, student participants simulated four orbits of a shuttle flight. Sanjay Limaye explained, "We pretended that the shuttle was in orbit, viewed Web pages, and exchanged information between the Student Mission Operations Centers (SMOCs) and the University of California, San Diego (UCSD), where the project is managed. We performed other tasks we will perform during the flight."

For their target observations, Hamilton and Spring Harbor students will focus on the impact of human activity on the Amazon Rain Forest. Hamilton middle school students will also look at active volcanoes, particularly Soufriere Hills in Montserrat.

Providing the technology boost for Madison's participants is TDS Telecom, a national telecommunications company based in Madison. Joe Keyes, in TDS' government regulatory affairs office, said, "This is a nice win-win project for everybody. It's a nice blending of our subsidiaries' capabilities, in that TDS Metrocom provided telephone lines and TDSNet gave Internet access."

EarthKAM was started as KidSat by the first U.S. woman astronaut, Sally Ride, now a Physics professor at UCSD. EarthKAM observations are integrated into school curriculums in earth sciences with activities in math, science, oral and written communication, research, computer use, and team work activities.

EarthKAM is funded by NASA and is a collaboration of the University of California at San Diego (UCSD), Johns Hopkins University's Institute for the Academic Advancement of Youth (IAAY), and the Jet Propulsion Laboratory (JPL) which also funds global mosaics of satellite imagery created by SSEC. Madison's Evjue Foundation partially supports EarthKAM and other outreach efforts at SSEC, and NOAA scientists at SSEC are helping students with their Amazon research.

Madison schools' EarthKAM activities can be tracked over the Internet at these Web sites: Spring Harbor:
http://www.madison.k12.wi.us/stugeon/kidsat.htm

Velma Hamilton: http://www.madison.k12.wi.us/hamilton/earthkam.htm
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- Terri Gregory, SSEC, (608) 263-3373

Space-
SSEC

HOLD FOR WEDNESDAY OCT. 14 P.M. RELEASE
CONTACT: Lawrence A. Sromovsky (608) 263-6785, sro@calypso.ssec.wisc.edu

Editors: Images to accompany this story can be found on the World Wide Web at http://news1.news.wisc.edu/photos/neptune.html The images include two comparative sets of stills taken by the Hubble Space Telescope in 1996 and in 1998. Also available is an 18 MB QuickTime movie that shows a full rotation of the planet. The movie can be obtained by contacting Nick Weaver at (608) 263-9141 or jnweaver@facstaff.wisc.edu Video tape of the movie can be obtained from Terry Devitt at (608) 262-8282 or trdevitt@facstaff.wisc.edu

HUBBLE PROVIDES A MOVING LOOK AT NEPTUNE'S STORMY DISPOSITION

MADISON - Using powerful ground- and space-based telescopes, scientists have obtained a moving look at some of the wildest, weirdest weather in the solar system.

Combining simultaneous observations of Neptune made with the Hubble Space Telescope and NASA's Infrared Telescope Facility on Mauna Kea, Hawaii, a team of scientists led by Lawrence A. Sromovsky of the University of Wisconsin-Madison has captured the most insightful images to date of a planet whose blustery weather - monster storms and equatorial winds of 900 miles per hour - bewilders scientists.

Blending a series of Hubble images, Sromovsky's team constructed a time-lapse rotation movie of Neptune, permitting scientists to watch the ebb and flow of the distant planet's weather. And while the observations, presented here at a meeting of the American Astronomical Society's Division of Planetary Science, are helping scientists tease out clues to the planet's stormy weather, they also are deepening some of Neptune's mysteries, said Sromovsky.

The weather on Neptune, the eighth planet from the sun, is an enigma to begin with. The mechanism that drives its near-supersonic winds and giant storms has yet to be discerned.

On Earth, weather is driven by energy from the sun as it heats the atmosphere and oceans. On Neptune, the sun is 900 times dimmer and scientists have yet to understand how Neptune's weather-generating machinery can be so efficient.

"It's an efficient weather machine compared to Earth," said Sromovsky. "It seems to run on almost no energy."

In an effort to dissect the distant planet's atmosphere and monitor its bizarre weather, Sromovsky and his colleagues obtained a series of measurements and images over the span of three of Neptune's rotations.

From those observations, Sromovsky said it is possible to measure Neptune's circulation and view a "strange menagerie of variable, discrete cloud features and zonal bands" of weather. Moreover, the new observations enabled Sromovsky's team to probe some of the deeper features of the atmosphere and to map Neptune's cloud tops.

"We can show some clouds are higher than others, that altitudes vary," he said. Knowing something about the topography of Neptune's clouds, provides a direct way to measure Neptune's powerful winds.

A looming mystery, he said, is the fate of huge dark spots, possibly giant storms. When the planetary probe Voyager visited Neptune in 1989, it detected the Great Dark Spot, a pulsating feature nearly the size of the Earth itself. Two years ago, Hubble observations showed the spot had disappeared, and that another, smaller spot had emerged. But instead of growing to a large-scale storm like the Great Dark Spot, the new spot appears to be trapped at a fixed latitude and may be declining in intensity, said Sromovsky, a senior scientist at UW-Madison's Space Science and Engineering Center.

"They behave like storms, and the Great Dark Spot was an exaggerated feature we haven't seen on any other planet. They seem to come and go, and rather than an exciting development of these dark spots, they dissipate."

Another strange aspect of the distant planet's weather are distinct bands of weather that run parallel to the Neptunian equator. The weather bands encircle the planet and, in some respects, may be similar to the equatorial region of the Earth where tropical heat provides abundant energy to make clouds.

"We can see regions of latitude where Neptune consistently generates bright clouds," said Sromovsky. The regions are both above and below the planet's equator, but he added that it was uncertain what their explanation is in terms of atmospheric circulation.

Sromovsky said that compared to the look provided by the Voyager spacecraft, Neptune is a different place: "The character of Neptune is different from what it was at the time of Voyager. The planet seems stable, yet different."

Sromovsky's Hubble observations were made with Wide Field Planetary Camera 2 and the Near Infrared Camera and Multi-Object Spectrometer. The different instruments allowed observations to be made in a variety of wavelengths, each providing a different set of information about Neptune's clouds, their structures and how they circulate.

Other members of Sromovsky's team include Pat Fry and Sanjay Limaye of UW-Madison's Space Science and Engineering Center, Kevin Baines of NASA's Jet Propulsion Laboratory, and Timothy Dowling of the University of Louisville.

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- Terry Devitt, (608) 262-8282, trdevitt@facstaff.wisc.edu

Trebach named to Illinois post

Susan Trebach, director of the Office of News and Public Affairs, has been appointed executive director of public affairs for the University of Illinois by President James Stukel.


Susan Trebach

When she assumes her new post at Illinois, Trebach will develop a public affairs program in coordination with the three campuses at Chicago, Springfield and Urbana-Champaign.

Trebach will be based at the UI's Chicago campus.

Trebach has been with UW-Madison for 12 years. She became director of the Office of News and Public Affairs in 1990.

"This is a wonderful opportunity for Susan," says Chancellor David Ward. "Illinois has recognized a person with tremendous insight for emerging issues, and Susan's appointment speaks to her abilities to develop innovative and effective public affairs programs."

Trebach has managed university communications activities for Ward and former Chancellor Donna Shalala, and has served as the university's chief spokesperson.

As director of the Office of News and Public Affairs, Trebach has been responsible for guiding media relations, publicizing university activities and publishing several university periodicals.

Trebach was hired in 1987 as an assistant director of the University News and Information Service and became associate director in 1988, developing a media workshop program for administrators and faculty. She coordinated the first statewide public opinion survey to assess public support for the university.

In her current position, Trebach has created a strategic communications plan for the university and developed award-winning institutional television spots, which air nationally.

Trebach also has been a driving force behind The Why Files, a popular and critically acclaimed web site that explores the science behind the news. The Why Files, part of UW-Madison Graduate School, first published on the World Wide Web in February 1996 (at http://whyfiles.news.wisc.edu). The Why Files blazed an early path to web popularity by providing cogent, accurate and often droll explanations of the science and technology that underlie the news of the day.

Before coming to campus, Trebach spent nearly a decade covering government and legislative news for the former Milwaukee Sentinel. Before joining the Sentinel, Trebach worked for the Lowell Sun in Massachusetts.

She attended graduate school at Boston University's School of Public Communications and completed a science writing fellowship at Argonne National Laboratory. She earned a bachelor's degree in biology at the State University of New York at Buffalo, where she also was the first female managing editor of the student newspaper.

She is married to Arthur Ellis, the Meloche-Bascom Professor of Chemistry. They have two children, Joshua and Margot.

A search committee will be named to screen applicants for a director of communications to succeed Trebach, Ward says. ■

The China question

Assumptions about East and West cloud thinking about Chinese politics

Jeff Iseminger

Considering the Chinese as essentially and forever authoritarian — as many Westerners do — denies the complexity of culture and its capacity for change, says one of the nation's leading Sinologists.

China, a fast-rising power on the world stage, is the focus of much western political speculation, especially as the Chinese government is dogged by accusations of human-rights abuse. But Edward Friedman, a UW-Madison political scientist, believes this behemoth of a nation possesses the cultural preconditions for democracy — just as the United States has the potential for despotism.

"All cultures contain seeds of the best and the worst of which humanity is capable," says Friedman. "They are repertoires of possibilities."

That rich repertoire is often reduced to Johnny One Note when Westerners regard China, he says. They idealize the West as the world's repository of democracy and demonize the East as a sinkhole of political repression.

"Considering East and West as a pair of permanent opposites in which the West is morally superior creates an obstacle to clear thinking," says Friedman, whose consuming passion is to destroy that stereotype. Stereotype busting sits at the heart of his courses, such as The Challenges of Democratization, and his books, such as *The Politics of Democratization: Generalizing East Asian Experiences.*

"For example, the West does not have a monopoly on the elements of democracy. It never did," Friedman says. The notion of a unified, democratic Europe and North America set against a totalitarian East is largely a product of Cold War propaganda, says Friedman, not a deep historical truth:

- Ancient democratic Athens was misogynist and enslaving as well as freedom-loving.
- The English long treated Irish Catholics not as part of "the West," but as savages beyond the pale of civilization.
- The American colonies broke with Britain because they felt they were fundamentally different from their rulers.
- Two of the three most populous democracies in the world — Japan and India — are in the East.

The West vs. East way of looking at the world is dubious intellectually as well as historically. As Friedman notes, every culture has a quiver full of possibilities and uses them in different ways, at different times, to different degrees. So to consider the Chinese as essentially and forever authoritarian is to strip away the complexity of culture — or try to — and deny its capacity for change.

"Any culture is fought over by its members," says Friedman. "Just one question in our own culture — What is America all about? — gets very different answers."

The here-and-now-of-it, however, is that China has been roundly criticized for its suppression of dissidents and its treatment of Tibetans. Unfortunately, the Chinese seem to see themselves as benefactors raising Tibetans out of a feudal existence, says Friedman.

That attitude is similar to the one held by European settlers of the Americas, who believed they should bring indigenous people into the fold of "civilization" — or eradicate them.

"China is a rising nation," says Friedman. "Rising groups — the Germans, British and Americans included — have typically considered themselves superior and resented outside interference."

Ever since the Monroe Doctrine, for instance, the United States has regarded Latin America as almost its protectorate and has taken great umbrage at outsiders' criticism of American actions south of the border.

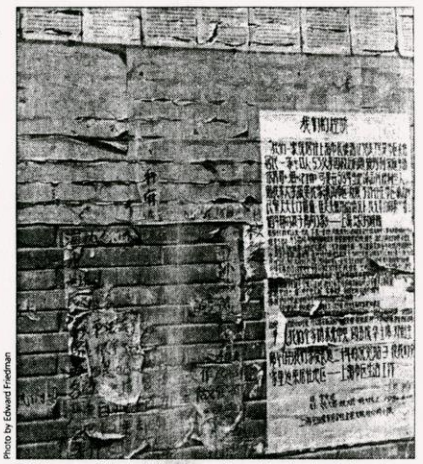
Photo by Edward Friedman

This is one of the last "democratic posters" not yet torn down by authorities in Peking during the so-called democratic wall movement that arose across China in 1978-79. The upsurge of posters demanded democracy and listed grievances against communist rule.

Friedman's point: Looking at China or any other culture should be what he calls "an exploration of ambiguity." It should be a painting that calls for a very large palette, instead of a study in black and white.

In the end, China's future will be decided by the Chinese. But those who care about human rights can help in modest ways, says Friedman, who sits on the board of directors for a new publication, the *Taiwan Human Rights Journal.*

"A tyrant often tells his victims, 'You're all alone, no one cares about you.' By maintaining a human-rights dialogue with the Chinese, both rulers and ruled, we tell the victims that they are not alone." ■

Hubble reveals Neptune's stormy disposition

Terry Devitt

Using powerful ground- and space-based telescopes, scientists have obtained a moving look at some of the wildest, weirdest weather in the solar system.

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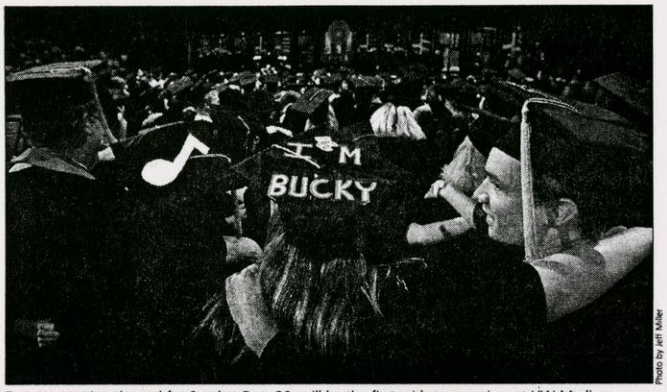

Photo by Jeff Miller

Two ceremonies planned for Sunday, Dec. 20, will be the first midyear exercises at UW-Madison to be held in the Kohl Center. About 1,600 students will be eligible for degrees this December.

Clinton biographer to speak at winter commencement

Barbara Wolff

The author of several definitive articles and books about President Bill Clinton will speak at the midyear commencement Sunday, Dec. 20.

David Maraniss won the Pulitzer Prize in 1993 for a series of articles on Clinton's life and career. He published *First in his Class* in 1995 and a second Clinton study, *The Clinton Enigma*, earlier this year. Maraniss is finishing a biography of former Green Bay Packer coach Vince Lombardi. That book will be out next fall. Currently a writer for the *Washington Post*'s national staff and an analyst for NBC, Maraniss also has written about former House Speaker Newt Gingrich, the savings and loan scandals, integration in American institutions and more.

The UW-Madison Office of the Secretary of the Faculty oversees commencement. Secretary of the Faculty David Musolf says senior class officers choose a commencement speaker in consultation with staff from his office and the Dean of Students office.

"We encourage the class officers to consider outstanding individuals with a Wisconsin connection," Musolf says. "David Maraniss grew up in Madison, virtually in the shadow of the university, and has an interesting perspective on our institution and state. We are honored that he has accepted our invitation and will give the 'charge to the graduates' at both of our winter commencement ceremonies."

All Ph.D., M.F.A., master's and professional degree candidates, and bachelor's degree candidates in agriculture, education, human ecology, medicine, nursing and pharmacy attend the 1 p.m. ceremony. Bachelor's degree candidates in business, engineering and letters and science celebrate their graduation at 4 p.m.

For more information, contact the university's Commencement Hotline, 262-9076. ■


Photo by Jeff Miller

Mathematics teaching assistant Richard Karwatka leads an algebra and trigonometry class.

TAs

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1986 will of Florence Felten French to recognize "superior achievement in inspirational teaching." Florence Felten French earned a master's in speech from UW-Madison in 1928, and her husband, Sidney J. French, earned a master's (1927) and doctorate (1928) in chemistry from the university.

Recipients were honored at a dinner banquet Oct. 15. Each received a $400 stipend. Nominations were sought from each department in Letters and Science, the university's largest college.

"Some people criticize a system where teaching assistants are employed, suggesting they don't contribute much to the student learning environment," says Craig. "But student comments about these award recipients show that teaching assistants can add a great deal to what the student gets out of a course. They share so much excitement about learning new subjects."

For Karwatka, who hopes to teach at a small university such as his alma mater after completing his doctorate, the award was a nice surprise.

"It's nice that the university is paying some attention to their first-year graduate students and first-year teaching assistants and recognizing their contribution," he says. "That first year is full of transition. It's a rocky start when you come from a campus of 5,000 to a campus of 50,000." ■

Do your holiday shopping right here on campus

From T. rex tooth replicas to weather devices, UW-Madison has plenty to stuff your stockings

Terry Devitt

Fearful of the mall this holiday season? Weary from trekking across acres of parking lots? Having a hard time running that elusive, all-important gift to earth?

Relax. Here, in no particular order, are 10 gift ideas from UW-Madison that can make holiday shopping easier and less aggravating. All are unique to the university and sales benefit campus academic, outreach and social programs.

- A night in the Memorial Union: For as little as $51 a night, you can reserve a room with a view of Lake Mendota and the Union Terrace. The Union has a half-dozen guest rooms ranging in price from $51 to $68, all with lake views. (Prices are a bit higher for non-members.) Make your reservations early. Rooms are hard or impossible to come by on football weekends and during commencement. To book a room, call 265-3000.
- A cast replica of a T. rex tooth: Take home a pointed reminder of the top carnosaur of the Cretaceous. A plaster cast that is an exact copy of a 6-inch T. rex tooth unearthed during a UW-Madison Geology Museum expedition to the badlands of eastern Montana. Cost: A bargain at $12. Available only at the UW-Madison Geology Museum, Room A120 Weeks Hall, 1215 W. Dayton St.
- Landscape Plants of the Upper Midwest on CD ROM: Plan your landscaping with this CD from the UW-Madison Department of Horticulture. Features 1,800 quality color photographs of more than 600 species of plants displaying flowers, fruit, fall color and other ornamental features. Cost: $20.95. Call Karen Denk at 262-1490 to reserve a copy for the gardener in the family. Or mail a check or money order, payable to the Department of Horticulture, to 1575 Linden Drive, Madison, WI 53706.
- John Steuart Curry Exhibit Catalog: The Elvehjem Museum's 1998 exhibit of the work of UW-Madison's first artist in residence is cataloged. Available in hardcover for $32 from the Elvehjem's shop, in the museum at 800 University Ave.
- Say it with cheese: What better way to show affection or perpetuate a stereotype than by a gift of cheese? From Babcock Hall and the Food Science Club, choose from an assortment of gift boxes with more species of cheese than you can shake a sausage at. Prices range from $11 to $40. Available at the Babcock Dairy Store, 1605 Linden Drive, or by calling 262-3045.
- Concert tickets: The UW-Madison 150th Anniversary Concert, Feb. 7, from 1 p.m. to 3 p.m., will be a feast of music featuring the School of Music's symphony orchestra, jazz ensemble, choral union, concert choir and UW-Madison marching band. Cost: Adults $5, students $3, children age 12 and under $2. Tickets go on sale Wednesday (Dec. 9) at the Kohl Center and all Ticketmaster locations. Proceeds benefit the Sesquicentennial Undergraduate Scholarship Fund.
- Nostalgia: Available vicariously through a set of 12 note cards featuring the art deco prints of artist Charles R. Overman. The artwork, used in the 1932 Badger Yearbook, features scenes from University of Wisconsin campus life of 65 years ago. Available at University Book Store. Cost: $29.95. Proceeds benefit the Wisconsin Alumni Association in support of UW-Madison sesquicentennial activities.
- Millions of books: For the book lover, a membership in the Friends of the Libraries is a way to support the continuing excellence of a great research library system. Benefits include Friends lectures, Friends magazine, invitations to special library events and a membership card that allows access and borrowing privileges. Cost: $15 for students, $25 for individual memberships and $30 for families. For membership details, call 262-2566 or stop in Room 976 of the Memorial Library, 728 State St.
- The gift of research: For $5, you can support research into the diseases and afflictions faced by our pets. The UW-Madison School of Veterinary Medicine Companion Animal Fund will sign and mail a card in your name to the animal lover on your list. The deadline for ordering cards is Monday, Dec. 14. Send a list of intended card recipients along with their complete addresses and an indication of how you wish the cards to be signed to: Companion Animal Fund, 2015 Linden Drive West, Madison, WI 53706. Checks should be made payable to the UW Foundation.
- For the weather weenie in your life: You'll never have to go to the trouble of hoisting the old weather balloon again if you're packing the AERI, the Atmospheric Emitted Radiance Interferometer. Made only at UW-Madison's Space Science and Engineering Center, the AERI is a portable, computer-sized device that can provide a handy profile of atmospheric temperature, trace gases such as ozone and carbon dioxide, and water vapor. Cost: $250,000. Scientist not included. ■

Sesquicentennial hiring

continued from page one

is often the crucial difference between those that succeed and those that fail," Wiley says.

"It is, therefore, very important that some of our scarce positions be available for staffing newly emerging areas that would not likely be the highest priorities of any one department, but that are among the high priorities for several departments. At the same time, some individual departments may be poised to achieve dramatic results with the addition of just a few positions. Proposals making that case are also encouraged."

The Sesquicentennial Hires will be in addition to the estimated 400 professors the university will hire in the next four years due to normal turnover.

Wiley says that groups who do not feel they can do a credible job on this schedule should keep in mind that additional rounds of hiring are planned for at least the next three years. For more information, contact the Provost's Office, 262-1304. ■

Space
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FOR IMMEDIATE RELEASE 12/7/98

TEN ONE-OF-A-KIND HOLIDAY GIFTS FROM UW-MADISON

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* John Steuart Curry Exhibit Catalog: The Elvehjem Museum's 1998 exhibit of the work of UW-Madison's first artist in residence is cataloged. Available in softcover for $32 from the Elvehjem's Museum Shop, in the museum at 800 University Ave.

* Say it with cheese: What better way to show affection or perpetuate a stereotype than by a gift of cheese? From Babcock Hall and the Food Science Club, choose from an assortment of gift boxes with more species of cheese than you can shake a sausage at. Prices range from $11 to $40. Available at the Babcock Dairy Store, 1605 Linden Drive, or by calling (608) 262-3045.

* Concert tickets: The UW-Madison 150th Anniversary Concert, Feb. 7, from 1 p.m. to 3 p.m., will be a feast of music featuring the School of Music's symphony orchestra, jazz ensemble, choral union, concert choir and UW-Madison marching band. Cost: Adults $5, students $3, age 12 and under $2. Tickets go on sale Wednesday (Dec. 9) at the Kohl Center and all Ticket Master locations. Proceeds benefit the UW-Madison Sesquicentennial Undergraduate Scholarship Fund.

* Nostalgia: Available vicariously through a set of 12 note cards featuring

the art deco prints of artist Charles R. Overman. The artwork, used in the 1932 Badger Yearbook, features scenes from University of Wisconsin campus life of 65 years ago. Available at University Bookstore. Cost: $29.95. Proceeds benefit the Wisconsin Alumni Association and are used in support of UW-Madison sesquicentennial activities.

* Millions of books: For the book lover, a membership in the Friends of the Libraries is a way to support the continuing excellence of a great research library system. Benefits include Friends lectures, Friends magazine, invitations to special library events and a membership card that allows access and borrowing privileges. Cost: $15 for students, $25 for individual memberships and $30 for families. For membership details, call (608) 262-2566, or stop in Room 976 of the Memorial Library, 728 State St.

* The gift of research: For a few dollars, you can support research into the diseases and afflictions faced by our companion animals, also known as pets. For a donation of $5 per card, the UW-Madison School of Veterinary Medicine Companion Animal Fund will hand sign and mail a card in your name to the animal lover on your list. Hurry, the deadline for ordering cards is Dec. 14. Send a list of intended card recipients along with their complete addresses, and an indication of how you wish the cards to be signed to: Companion Animal Fund, 2015 Linden Drive West, Madison, WI 53706. Checks should be made payable to the UW Foundation.

* For the weather weenie in your life: You'll never have to go to the trouble of hoisting the old weather balloon again if you're packing the AERI, the Atmospheric Emitted Radiance Interferometer. Made only at UW-Madison's Space Science and Engineering Center, the AERI is a portable, computer-sized device that can provide a handy profile of atmospheric temperature, trace gases such as ozone and carbon dioxide, and water vapor. Perfect for airport managers and professional weather forecasters. Cost: $250,000. Scientist not included.

###

-- Terry Devitt (608) 262-8282, trdevitt@facstaff.wisc.edu

Space - SSEC

FOR IMMEDIATE RELEASE 12/15/98
CONTACT: George R. Diak (608) 263-5862; george.diak@ssec.wisc.edu

CONSORTIUM TO BRING SPACE AGE FORECASTS TO FARM, FOREST

MADISON - A new, NASA-funded research initiative, combining expertise from universities, industry, and state and federal government promises to bring space age technology to farm and forest in the Upper Midwest.

Organized as a consortium and based at based at the University of Wisconsin-Madison and the University of Minnesota-Twin Cities, the new program is one of seven regional earth science application centers funded as part of a $14 million effort to direct NASA technology to solving environmentally related societal problems.

The UW-Madison component of the new consortium is a combined effort of the Space Science and Engineering Center (SSEC) and the Departments of Atmospheric and Oceanic Sciences, Soil Science and Forest Ecology and Management. It will be directed by George Diak, a senior SSEC scientist, and will focus on the development of new tools -- computer models and new remote sensing and meteorological technologies -- to aid management decisions made by agricultural and natural resource managers. UM-Twin Cities scientists will concentrate on monitoring natural resource bases themselves.

The new center, Diak said, has two primary goals: "We want to have a significant positive impact on the economy of the Upper Midwest by applying computer models and new measurement tools to current resource problems, and we want to create new tools to help give us insight into the potential effects of different management practices.

"This includes looking at things like the potential effects of regional climate changes and their influence on forestry and agriculture, and our ability to sustain natural and managed environments," Diak said.

Other members of the Wisconsin component of the consortium include Champion International Corp., Case Corp. of Racine, the Wisconsin Department of Natural Resources and the U.S. Forest Service.

According to Diak, the consortium will work on building computer models that depend on remote sensing technology, satellite-based instruments capable of making detailed measurements of the atmosphere or land over large geographic distances. As NASA's Earth Observing System is deployed over the next decade, a wealth of new satellites and satellite-based tools for measuring the Earth and its atmosphere will come into play.

Using those measurements to power new computer models, Diak said, scientists can help farmers and resource managers determine things like soil moisture, nitrogen content of the soil and grain moisture as crops mature. In forests, by observing and modeling conditions of the soil, plants and atmosphere, it may be possible to forecast disease and insect infestations.

Already, Diak said, there are models that help farmers decide when to

irrigate, when to apply chemicals for disease control, and that warn cranberry growers of the potential for overnight frost. Examples of those models can be found on the World Wide Web at http://bob.soils.wisc.edu/nasacan.html.

The consortium's industrial members would help find "cost-efficient methods of commercializing emerging farming technologies," said James Stoddart, vice president for Case Corporation's Advanced Farming System's Division.
###
-- Terri Gregory (608) 263-3373, terri.gregory@ssec.wisc.edu

SSEC

150 YEARS

UNIVERSITY OF WISCONSIN • SINCE 1848

Chancellor's Initiative to begin

Erik Christianson

Since the earliest days of the university's existence, faculty members have worked with government officials to help solve the problems facing Wisconsin.

A new initiative about to begin will enhance that long-standing relationship. The Chancellor's Initiative includes an orientation seminar for new legislators, a speakers series, a staff luncheon series, faculty-legislative pairings and policy forums.

The name for the initiative comes from Chancellor David Ward's desire for the university to expand and redefine its service to the state, says Donald F. Kettl, director of the Robert M. La Follette Institute of Public Affairs.

"We are working out of the tradition of the Wisconsin Idea and at the same time seeking to adapt to the new challenges facing government today," says Kettl, who is coordinating the initiative with Charles Hoslet, special assistant to the chancellor for state relations.

The orientation for new state legislators is planned in January. Faculty will provide an overview of important issues, in conjunction with legislative leaders of both parties, and outline university resources.

Six staff luncheons are planned in spring for state and local government officials.

The faculty-legislative pairings will identify areas of interest among key legislators and link them with professors who are experts in those areas.

The policy forums, while still in the planning stages, will set up dinners between faculty and lawmakers with discussions on topics of mutual interest.

Kettl says Democratic and Republican lawmakers have reacted positively.

"This is the kind of thing that people continue to tell us they need and expect and want the university to be doing," Kettl says. "It demonstrates the university's commitment not just to respond to issues but to define our responsibility to the state in exchange for the taxpayers' generosity to us through the state budget." ■

Sesquicentennial snapshot

Photo courtesy UW-Madison Archives

The Father of Weather Satellites

Atmospheric science professor Verner Suomi (left, with colleague Herman La Gow) inspects the features of a vintage 1959 weather satellite. The UW-Madison professor revolutionized the way the world sees the weather as inventor of the imaging technologies behind modern weather satellites. His "spin-scan camera" gave meteorologists their first moving pictures of weather systems. His career at UW-Madison, from 1948 until his death in 1995, included co-founding the Space Science and Engineering Center in 1965, now a world-class center for studying the atmospheres of earth and other planets. Heralded as a "giant of modern science," Suomi said he took most pride in the fact that his inventions improved the public's safety from severe weather.

Series features Soglin

The next sesquicentennial breakfast features Paul Soglin, former mayor of Madison and UW alum, who will discuss student activism on and of campus.

Soglin will present a 30-year historical perspective, from his days as a student to his experience as a city alderman and mayor. The talk is scheduled at 7:30 a.m Tuesday, Dec. 8.

As part of the celebration for the university's 150th anniversary, the Daybreak Discussions series provides an opportunity for campus and community members to gather, reflect on the past and look to the future. The discussions are scheduled each month (except January) during this academic year. Open to all, the talks begin at 7:30 a.m. and conclude by 8:45 a.m.

The series is sponsored by the Chancellor's Office, the Morgridge Center for Public Service and Wisconsin Union. For information, call the Morgridge Center, 263-2432. ■

SESQUICENTENNIAL QUIZ

Okay, once again let's test your knowledge of the university's rich history with the *Wisconsin Week* Sesquicentennial Quiz. This second in a series of exams will separate the true sesquicentennial scholars from the sea of wannabes.

Questions

1 Who was the first UW faculty member to win a Nobel Prize?
2 Who was Wisconsin's first and — so far — only Heisman Trophy winner?
3 How did UW pharmacist Dale Wurster change your life?
4 What part of the evening newscast can you credit to UW-Madison?
5 To which country did UW students travel for the first study abroad program?
6 What did UW art professor Harvey Littleton accomplish in 1962?
7 For which organization has UW-Madison produced more volunteers since 1990 that any college in the nation?
8 Which summertime acronym is associated with UW-Madison?

Answers

1 **Joshua Lederberg**. His work, which explained why bacteria develop resistance to antibiotics, won him a Nobel Prize in 1958.
2 Badger fullback **Alan Ameche**, who played both offense and defense on a team that went to the Rose Bowl in 1953.
3 Dale Wurster, in 1959, invented a technique **to easily coat pills**, making medicine easier to swallow.
4 UW's Verner Suomi invented a camera capable of taking pictures of Earth from satellites, part of any modern-day **weather report**.
5 In 1961, students traveled to **India**. Students have attended UW programs in every continent except Antarctica.
6 Harvey Littleton forged the **world's glass-art movement** by creating a studio-scale furnace hot enough to mold glass into a work of art. Artist Dale Chihuly, a student of Littleton, created the colorful sculpture in the Kohl Center's lobby.
7 Through 1997, 2,237 UW graduates have chosen to defer salaries and careers for a humanitarian calling in the **Peace Corps**.
8 **SPF**, Sun Protection Factor. Sunscreen ratings were developed based in part on the work of dermatologist Derek Cripps. ■

FLASHBACK

HISTORICAL HIGHLIGHTS

Students need books to study, and, to that end, UW started building a library of donated books in 1849. The first collection, opened in September 1851 on the fourth floor of North Hall, housed about 800 donated volumes — a bit humble in the reflection of today's 45 libraries and 5.8 million volumes. Memorial Library, with more than 3 million volumes, houses the largest single collection in Wisconsin and draws more than 1 million visits a year.

PEOPLE IN OUR PAST

In 1875, when **E.A. Birge** arrived at UW-Madison as a 24-year-old instructor in natural history, he brought with him an insatiable curiosity about lakes and streams. Soon after his arrival, limnology — the study of inland waters — was founded in North America. Today, UW's tradition of lake research makes Lake Mendota and other Wisconsin waters among the best-studied in the world, and UW research helps ensure the well-being of those treasured resources. ... The nation's oldest Scandinavian studies program found a receptive home at UW-Madison in 1875. Founder **Rasmus B. Anderson** assembled a huge library of Norwegian literature and provoked controversy with his own book asserting that Columbus didn't discover America.

CAMPUS MEMORIES

"Sometime during 1954-1958, the period in which I was a UW undergrad, I had the privilege of serving on the Memorial Union Music Committee, under the direction of a wonderful woman whose name I cannot remember. She was knowledgeable, dynamic and a great tutor for students. She showed us how to do some of the basics of arranging concerts, presentations, and other events for the committee. Often, we were a part of pre-concert dinners with the noted musician or conductor. It was a heady and wonderful experience.

"Now that I am many years an alumna, I find myself still drawing on the grace, poise, diplomacy and planning skills which she modeled for us. I run an annual conference in Portland for researchers and family members interested in improving children's mental health; it gets outstanding reviews from participants. My Union experience was and is undeniably valuable and long lasting."

— Kaye J. Exo
BS '58, MS '76

To offer your memory, visit: www. uw150.wisc.edu/memories/

RESOURCES

To keep up with Sesquicentennial goings-on, check out the activities and other information organized at the UW-Madison web site at: www.uw150.wisc.edu

FOR MORE INFORMATION

Peyton Smith, sesquicentennial coordinator, 265-3044, plsmith @mail.bascom.wisc.edu. The sesquicentennial office is in 96 Bascom Hall.

Space - Space Sci + Engineering Center

FOR IMMEDIATE RELEASE 9/25/98
CONTACT: Sanjay Limaye (608) 262-9541, sanjayl@ssec.wisc.edu

(Editor's note: Coverage of the 1998 Division of Planetary Science 30th annual meeting in Madison is invited. Any reporter or news organization wishing to cover all or part of the upcoming DPS meeting Oct. 11-16 at the Monona Terrace Convention Center should contact DPS press officer Nadine Barlow at (407) 823-0251 for press credentials. A detailed meeting program can be found on the World Wide Web at http://www.ssec.wisc.edu/dps98/ Information about the Exploring the Solar System Public Exhibition is posted on the web at http://www.ssec.wisc.edu/dps98/dps98exh.htm DPS has arranged a series of press conferences, including mission updates for Mars and Eros, the Galileo-Europa Mission and new observations of solar system objects and phenomena. Please note that DPS has a camera policy for its meetings. Camera use is prohibited within the regular scientific sessions, including invited talks. Cameras are permitted in the press conferences, press room, hallways and displays areas.)

PLANETARY SCIENTISTS TO ALIGN IN MADISON

MADISON - From Oct. 11 - 16, Madison will be the focal point of the solar system for the community of scientists who study the planets and the menagerie of solar system objects as the American Astronomical Society's Division of Planetary Science (DPS) meets here.

Hosted by the University of Wisconsin-Madison's Space Science and Engineering Center, the meeting will take place at the Monona Terrace Convention Center and will feature a full menu of scientific talks, workshops for teachers and a public exhibition.

The DPS scientific program, according to local meeting coordinator Sanjay Limaye, will feature nearly 500 talks and papers on the planets, their moons, comets, asteroids, and planetary rings, among others. More than 600 scientists from around the country and world are expected to attend.

"This is the only time Madison is going to get a conference like this," according to Limaye, a scientist at UW-Madison's Space Science and Engineering Center. He noted the meeting, typically held on the East or West Coasts, was last held in the Midwest in St. Louis more than 20 years ago.

The late Cornell astronomer Carl Sagan was one of 10 scientists who founded DPS 30 years ago. He will be honored this year with the Gerald P. Kuiper Award, to be accepted by his widow, Ann Druyan.

For the public, there will be a special exhibition celebrating nearly four decades of space exploration. The exhibition will include displays, full-scale models of spacecraft and posters.

The free exhibition will be held at the Monona Terrace Convention Center's Exhibit Hall and will begin on Sunday, Oct. 11 in the late afternoon and will be open to the public through the morning of Oct. 16. Exhibitors include the Jet Propulsion Laboratory, the Space Telescope Science Institute, Yerkes Observatory, NASA, the National Oceanic and Atmospheric Administration, the Adler Planetarium and UW-Madison. Special exhibits include full-scale models and prototypes of spacecraft, including the Mars Pathfinder and Sojourner planetary probes. A meteorite from Mars will also be on display.

The exhibition, said Limaye, offers an excellent educational opportunity for schools across the state. In conjunction with the exhibition, lectures on current topics in space exploration

will be conducted for school-age children at the Monona Terrace Lecture Hall. On average, there will be three public lectures a day, said Limaye. Topics for lectures and teacher workshops include meteorite impacts, introduction to hands-on astronomy, exploring Mars and the Galileo mission to Jupiter.

Another public event to be held in concert with the meeting is a star party to be hosted at the by the Madison Astronomical Society. The star party will be held at the Monona Terrace Convention Center's Evjue Garden on Thursday evening, Oct. 15.

A full program for the meeting and information for the public and educators can be found on the World Wide Web at http://www.ssec.wisc.edu/dps98/

The meeting, exhibition and public lectures are being sponsored by the Evjue Foundation of Madison, Kalmbach Publishing Co., Wisconsin Education Association Council, Wisconsin Department of Public Instruction, Sky Publishing Co., Wisconsin Space Grant Consortium, Ball Aerospace, Lockheed Martin and Boeing Co.
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- Terry Devitt (608) 262-8282, trdevitt@facstaff.wisc.edu

SSEC

Aug. 21, 1998

TO: Editors, news directors
FROM: Terry Devitt, (608) 262-8282, trdevitt@facstaff.wisc.edu
RE: Forecasting (With a Wisconsin Twist) for the Folk Life Festival

The organizers of the Wisconsin Folk Life Festival, the celebration of Wisconsin culture and life to be held in downtown Madison Aug. 20 - 23, will have a weather security blanket of sorts in the form of Scott Bachmeier, an assistant researcher at UW-Madison's Space Science and Engineering Center.

As a volunteer, Bachmeier will use some of the world's best forecasting tools - state-of the art radar and satellite imagery - to help keep an extra eye out for any severe weather that could put a damper on the celebration of Wisconsin life. A satellite meteorologist, Bachmeier will be on call throughout the festival, tracking the dynamic late summer weather that, as much as cheese or beer, is a hallmark of the Badger state. Some of the tools at Bachmeier's disposal, moreover, have a Wisconsin flavor all their own: The Space Science and Engineering Center is considered to be the cradle of satellite meteorology having been founded by the late Verner Suomi, the UW-Madison scientist who conducted the first weather experiments in space and invented the technology that makes it possible for us to view the weather from satellites high above the Earth.

For more information, contact Bachmeier at (608) 263-3434 or Terri Gregory at (608) 263-3373.
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SSEC

August 26, 1998

TO: Editors, news directors
FROM: Brian Mattmiller, (608) 262-9772
RE: UW-Madison hurricane research

Scientists at UW-Madison's Space Science and Engineering Center (SSEC) are developing new tools to better predict the course of hurricanes. Chris Velden, a hurricane research expert with SSEC, and his team have developed products derived from remote sensors on meteorological satellites, which are currently being used by the National Hurricane Center forecasters for real-time predictions.

SSEC data is also being used in computer models to predict the course of this summer's hurricanes, including Hurricane Bonnie, which pounded the Carolina Coast this afternoon with heavy rains and 140-mph wind gusts.

Predicting the future course of a hurricane is one of the most difficult challenges for meteorologists, since hurricanes are composed of rivers of wind currents that vary in speed and direction. His colleagues' computer models are helping identify "atmospheric steering currents" within the hurricane, giving weather trackers a better idea of its eventual path. That information is crucial for better forecasting and improving public warnings.

Velden can also discuss some of the basic science of hurricanes, such as how and where they form and what determines their destructive strength. He can be reached at (608) 262-9168.
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Verner E. Suomi
1916–1995

A Man for All Seasons

The photo to the right shows Professor Verner E. Suomi (second from right) and colleagues reviewing the instrumentation for a 1950s experiment that measured the heat budget of an Iowa corn field.

Editor's Remarks

Contents of this memorial volume to Verner E. Suomi were compiled from records at the Space Science and Engineering Center, where Professor Suomi was based for most of his 40-year professional life. We have included his publications, committee work and honors he received. We have also excerpted tributes from colleagues at the University of Wisconsin–Madison. And we have included archived photos which help to document Professor Suomi's career visually.

The centerpiece of this publication is "Suomi's Creative Impact," by SSEC technical editor Russell Hall. This piece highlights Professor Suomi's ideas which, when implemented, have revolutionized weather forecasting and research.

The cover photo was taken of Professor Suomi by Michael Kienitz in 1994. Professor Suomi is holding the prototype instrument he invented and patented to measure the ocean–atmosphere heat flux.

Robert J. Fox, Terri Gregory,
Russell Hall, Jean Phillips, Tony Wendricks;
Space Science and Engineering Center Editorial Committee

Verner E. Suomi
1915–1995

Always One Step Ahead
A Man for All Seasons

Father of weather satellites – Imager of planets – Idea man

Professor of Atmospheric and Oceanic Sciences, of Soil Science,
of the Institute for Environmental Studies, of the University of Wisconsin–Madison

Founding director, Space Science and Engineering Center and
the Cooperative Institute for Meteorological Satellite Studies

International collaborator in global weather experiments

Favorite undergraduate meteorology professor – Creator of useful products for mankind

Heat budget student, from corn field to space

Invented spin-scan camera, to watch the weather move across the face of the Earth

Originated McIDAS to "drink from a fire hydrant" of satellite data

Zealous advocate for nonsmoking – Much honored colleague

Husband to Paula, father to Lois, Stephen and Eric – Friend in deed

A rare mind – Zestful enthusiasm

Determined, with wit, charm, class and style

Professor Verner E. Suomi (second from left) views early photos from the ATS (Applications Technology Satellite) with Professor Robert Parent (far left) and three University and NASA colleagues.

SSEC's Pioneer Venus crew surrounds Professor Suomi and a model of the Net Flux Radiometer, which measured heat flux in Venus' atmosphere in 1978. Left to right: back row, Gene Buchholtz, Bob Herbsleb, Wanda Lerum, Jerry Sitzman and Hank Revercomb; front row, Ralph Dedecker, Verner Suomi, Larry Sromovsky and Bob Sutton. Not shown: Evan Richards, Doyle Ford, and Tony Wendricks.

For a Mentor

Even now, two and a half years after his passing, it seems like only yesterday that Verner was looking over my shoulder, encouraging me to do something that seemed impossible to me but eminently feasible to him. At moments like this, when I try to write something about him, I always come back to the two qualities that made him truly exceptional to me:

- His unbridled optimism that we could do anything that we set our minds to. And it was *always* "we;" I very rarely heard him use the word "I." He absolutely excelled in enlisting people into his cause and making them feel like integral parts of the team. Indeed, most of us got so totally involved that after a while it was "our" plan or program, even though it sprang from his idea and *his* motivation of *us*.

- His enthusiasm for science, for life, for everything that he touched, along with the desire to share that enthusiasm with others. Verner had a most practical understanding of everything scientific, plugged into an incredibly original theoretical model of his universe. His greatest accomplishment was not a scientific achievement, but was his perceptive ability to immediately discern the comprehension level of people and to interact with them at that level in a manner in which true communication was achieved. (This, incidentally, led him to start most of his conversations with me with F=ma.)

After 40 years of association with him, never a day yet passes that I'm not involved in something that bears his imprint. He derived tremendous satisfaction from coaxing people into achieving a new "personal best," doing things that they themselves didn't know they could do. The legacy of Verner Suomi is that he made science exciting, and made you excited to be participating in it with him.

Robert J. Fox, Executive Director,
Space Science and Engineering Center

Tributes

Verner Suomi was a giant of modern science. His inventions were simple and elegant, and their consequences are ubiquitous. Anyone looking at a satellite image of the Earth on the evening weather is looking at the product of a rare mind.

John D. Wiley, Provost, University of Wisconsin–Madison

Even at the height of the Cold War, the nations of the world were collaborating on the Global Weather Experiment, a multiyear program designed to enhance substantially mankind's ability to predict the weather. As I joined in the planning for this bold undertaking, Vern's vision and straightforward enthusiasm were an inspiration, not only for younger scientists such as myself, but also for government officials and diplomats everywhere as they sought peaceful, yet productive, contacts between hostile ideologies. As he remarked at the press briefing introducing the experiment, "Certainly such undertakings cost money, but still less than a hamburger and french fries for every citizen of the United States."

Francis Bretherton, Director, Space Science and Engineering Center; Professor, Departmentof Atmospheric and Oceanic Sciences; University of Wisconsin–Madison

Verner Suomi's accomplishments bore unique signatures of imaginative genius, bold simplicity, unlimited enthusiasm and will to succeed. These skills, together with the mid-century ascent of technology and maturation of meteorology as a science, made for the era of Suomi's success. Suomi was sometimes characterized as a theoretician without equations, who had a way of creating many dreams and making some of them come true. He always admitted that only a few succeeded, but he invited debate, accepted changes, and let others worry about the final details. . . .

. . . [He] loved classroom teaching of undergraduates, and many considered his classes unforgettable. He asked students for curiosity, common sense, and positive attitudes. In return they got spirited explanations of complex phenomena and simple ideas for applications. Ultimately, his ways of thinking took precedence over detailed content. His teaching was no product of fixed procedures; it was an unrepeatable process that was a window into a mind in constant motion. By his example, students learned to inquire more boldly and effectively. . . .

Compilation

Verner Suomi's colleagues on the campus of the University of Wisconsin-Madison contributed these words, with one exception. Some are excerpted from longer pieces written as memorials to Professor Suomi. Some were written specifically for this volume. Those from staff of the Space Science and Engineering Center were written shortly after Professor Suomi died.

These reminiscences and reactions include those from:

- *Officials and faculty of the University of Wisconsin–Madison*
- *The Suomis' pastor*
- *Staff of the SSEC, which Professor Suomi founded and directed for thirty years*

All the statements describe in some fashion the impact of Professor Suomi's personality.

Professor Suomi and Herman La Gow inspect the spinning, polar-orbiting satellite on which the flat plate radiometer flew.

Verner Suomi's instincts to think big and act boldly made him influential in planning major scientific initiatives. They typically involved satellite observations and numerical prediction models developed by others, a marriage of the real world and theory which he deeply appreciated. These projects led to the maturation of global atmospheric science and its coupling with the oceans. . . .

Memorial Resolution of the University of Wisconsin–Madison Faculty, John A. Young, Donald R. Johnson, William L. Smith, Department of Atmospheric and Oceanic Sciences

Approximately one week before Professor Suomi passed away, I visited him in the hospital, [where] he made a special request, . . . [that] each of you were to be personally thanked for making his life so enjoyable and fruitful. . . .

In the 60s, while in [University of Wisconsin's] Science Hall and the days of faculty personally advising undergraduates, one young man reported to Verner Suomi that he was unable to enroll, since he did not have enough money to pay tuition. Without hesitation Professor Suomi offered moneys for his tuition. This young student later finished his undergraduate degree. . . .

Those of us who were privileged to visit with him in the hospital benefited from observing Verner as he approached death as a natural step within the process of life. As in his science with a pragmatic aim of benefiting mankind and being straight to the point, his spiritual desires were pragmatic and straight to the point. In knowing that he would enjoy only a few more days on this earth, his parting remarks on that Tuesday of the last week were to call attention to his prayer. [It is a] childhood prayer known to many of us:

Now I lay me down to sleep,
I pray the Lord my soul to keep,
If I should die before I wake,
I pray the Lord my soul to take. . . .

Donald R. Johnson, Director, Division of Earth Sciences, Universities Space Research Association; Associate Director, SSEC

As the Father of Satellite Meteorology, the innovator of the world's geostationary satellite weather surveillance system, Vern made many professional contributions that will truly benefit all of mankind for many generations to come. . . .

. . . He was a professional father, of a large community of younger scientists and former students. I have been truly amazed at the number of scientific colleagues with whom I talked in two weeks who told me what a tremendous inspirational force Vern was on their professional career. Having him as a thesis advisor was enough to land you a good job!

William L. Smith, Chief, Atmospheric Sciences Division, NASA Langley Research Center; Associate Director, SSEC

Professor Suomi invented numerous satellite instruments, leading to a better understanding of the earth-atmosphere system and its global circulations. From conducting the first American meteorological experiment ever from a satellite, to investigating the planets with space probes, to inventing the geostationary spin-scan camera, he recorded an extraordinary number of scientific achievements. . . . Two stories illustrate the Suomi legend.

Last month I was visiting with a scientist who worked on the Meteosat [European meteorological satellite]. He recalled his first meeting with Suomi. It came in the middle of the night as the first Meteosat water vapor image was recorded; Suomi was visiting and was there as the image was rectified and displayed. His excitement at seeing the atmosphere displayed in this unique way was infectious. Verner proceeded to explain the many new aspects of the atmosphere that were immediately obvious to him. More than twenty years later, this experience remains a highlight of this French scientist's life.

As I was finishing my doctorate in physics, Professor Suomi showed interest in hiring me for a position in his research center. After a brief introduction, he asked if I knew any meteorology. When I sheepishly responded that I did not, he enthusiastically welcomed me to his team remarking that he preferred that I didn't have any preconceived notions. I became another of Suomi's science disciples. He was always teaching as well as learning. He loved his work and his people. Those who had

Honors

1961 Meisinger Award, for aerological research achievements, by the American Meteorological Society (AMS)

1965 Foreign Member, Finnish Academy of Sciences

1966 Member, National Academy of Engineering, U.S.

1968 Carl-Gustaf Rossby Award, AMS

1970 Foreign Member, Deutsch Akademie der Naturforscher, Germany

1971 Robert M. Losey Award, in recognition of outstanding contributions to the science of meteorology as applied to aeronautics and for his creativity and ingenuity in designing advanced meteorological sensors for satellite applications as exemplified by his spin-scan camera which has made it possible to view the earth's atmosphere as an entity, American Institute of Aeronautics and Astronautics

1975 Foreign Member, International Academy of Astronautics, France

1976 Elected Member, American Philosophical Society

1977 Elected Fellow, Academy of Arts and Sciences

1977 Harry Wexler Professorship of Meteorology, University of Wisconsin-Madison

1977 National Medal of Science, National Science Foundation

1980 Charles Franklin Brooks Award, for his many contributions of wisdom and leadership, both formal and informal, but especially as Councilor and President of the American Meteorological Society, AMS

1980 Exceptional Scientific Achievement Medal for his outstanding accomplishments and contributions to the Pioneer Venus Project, NASA

1980 William T. Pecora Award, for outstanding application of remote sensing of the atmosphere, Society of Exploration Geophysicists

1980 Honorary Membership, Wisconsin Academy of Science, Arts, and Letters

1983 Honorary Degree of Doctor of Science for his major role in ushering in a new age of global weather observations State University of New York–Albany

1984 Franklin Medal for contributions and leadership in the broad field of atmospheric research. For his pioneering vision, research, and leadership in the development of satellite meteorology and for development of the spin-scan camera which has revolutionized weather observation. Franklin Institute, Philadelphia, Pennsylvania

1984 Wisconsin Alumni Research Foundation Senior Distinguished Research Professor, UW-Madison

1985 Commemorative medal for his contributions to international programs in geophysics, Soviet Geophysical Committee

1985 Silver medallion for outstanding pioneering contributions critical to the development of U.S. civil operational satellite systems and services, National Oceanic and Atmospheric Administration, U.S.

1985 Listed in *American Men & Women of Science*

1986 Phi Kappa Phi National Scholar

1986 Listed in *Who's Who in America*

1988 Honorary Member, AMS

1988 Nevada Medal (first recipient), Desert Research Institute

1990 Walter Ahlström Prize (first recipient) for his pioneering work in space-based remote sensing of the global environment, The Walter Ahlström Foundation, Finland

1992 Honorary Member, American Association for the Advancement of Science

1993 38th International Meteorological Organization Prize for pioneering contributions as father of weather satellites, establishing the field of satellite meteorology, World Meteorological Organization

the privilege of working with him remember his lessons, not just about meteorology, but also about life.

W. Paul Menzel, Science Director, Cooperative Institute for Meteorological Satellite Studies, University of Wisconsin–Madison; Team Leader, Advanced Satellite Products Team, National Environmental Satellite Data and Information Service, National Oceanic and Atmospheric Administration

In the spring of 1948 I had been talking to the Dean of Letters and Science for some time about bringing Verner Suomi to the University. There was considerable support from the College of Agriculture, especially after he had visited and demonstrated the kind of instrumentation he was developing, and its application to agricultural meteorology.

When in mid-spring I suggested to the Dean that in order for atmospheric science to develop there should be a separate Department of Meteorology at Wisconsin, Dean Ingraham said, in essence, "Okay, you are it effective July first." There had been reluctance on the part of the Geography Department's chairman to add more staff in meteorology. I then asked whether I could recruit Suomi. I was pleasantly surprised when he said yes.

When I contacted Verner, he had also been contacted with a job offer from Iowa State. Verner consulted a friend who had worked there who told him that when he lived in Iowa he went to Wisconsin for his vacation. So Suomi accepted our offer.

On the 15th of July I drove to Chicago to bring the Suomi family to Wisconsin. The sun was shining in Wisconsin, but rain began at the Illinois line, and was heavy by the time I got to Chicago. After we had loaded and were leaving Chicago, Paula Suomi said, "What a miserable day to be moving!" I replied that she shouldn't fret because the sun shone in Wisconsin. As we crossed the border the sun appeared and the rain stopped. Both Paula and Verner said, near the time of Verner's death, that they remembered that day and that the sun had continued to shine for them all their time in Madison.

On the 100th birthday of the state and of the university, the present Department of Atmospheric and Oceanic Sciences was born—as a department of Meteorology. Now on the sesquicentennial of the state the

Department will celebrate its Golden Anniversary. To me it is also the fiftieth anniversary of a close friendship and collaboration.

Reid A. Bryson, Emeritus Professor, Departments of Geography, and Atmospheric and Oceanic Sciences, and the Institute for Environmental Studies; Senior Scientist, Center forClimatic Research, University of Wisconsin–Madison

Verner Suomi delighted in, as he said, "dabbling around in the wonders of creation." He attributed his gifts as a scientist to God, who he revered and trusted. He had a simple and profound faith in God which gave him the freedom to seek truth with both scientific methodology and a good sense of awe. His goal was to encourage his students to do the same. He lived what he believed.

The Reverend Harvey S. Peters, Senior Pastor, Luther Memorial Church

From staff of the Space Science and Engineering Center

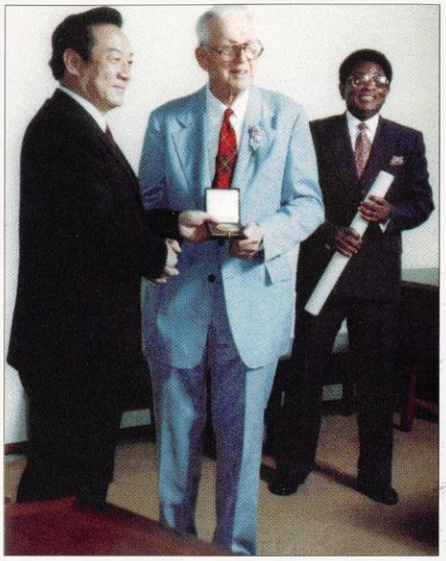
In spite of the fact that he was world renowned, he still took the time to know us all by name and would always have time for a friendly and personal greeting. He treated us all as valued and competent contributors to the center, and in doing so he was able to inspire and motivate us to do just a little bit extra. It is surely this quality in him which made the Space Science and Engineering Center grow to such world prominence.

David E. Jones, Electronics Technician 6

Vern was a pioneer in developing meteorological satellite technology, and was often referred to as the "father of weather satellites." He was my advisor and mentor, and while his innovation and technological creativity was unsurpassed, and will be dearly missed, his inspiration will live on here at UW.

His philosophy was best summed up by the phrase:
"Don't just ask 'why,' ask 'why not?'"

Christopher S. Velden, Researcher



Professor Suomi, center, receives the 38th annual IMO prize from World Meteorological Organization President, Zou Jingmeng (left), and WMO Secretary-General, G.O.P Obasi.

Coming to work for Professor Suomi was the best thing that has happened in my professional life. He encouraged me to publish and to get a Ph.D., and he gave me the opportunity to manage his 4-D graphics project. He cared deeply about the people who worked for him and his strength lifted us all up.

William L. Hibbard, Associate Scientist

Thank you Vern, "Spasibo, Suomi," to misquote a mentor, a friend, and a provocateur. (Vern, as only he could, used the phrase "Spasibo, Sputnik" in his address to the Soviet Space Forum in Moscow on the 30th anniversary of Sputnik in 1987, to say "thank you very much, Sputnik.")

... You have had a very positive impact on my life. The blend of objectivity and chaotic irrationality is enigmatic, but the undiluted dedication to understanding nature (and people, and fun, and exploration, and ego, and obfuscation, at times) is clearly unique. You have set an example, not perfect and God-like, but flawed and yet superhuman–unmatchable.

You engendered the super energy and power that can be unleashed by genuinely inspired interest in solving important problems for mankind (and the challenge of it).

Henry E. Revercomb, Senior Scientist

Pierre Morel, co-organizer of the World Weather Experiment, joined Professor Suomi at the ceremony honoring him as the 38th recipient of the World Meteorological Organization's IMO prize. Festivities were held in Madison, WI, on 13 May 1994.

I will miss the friendly hello and the small pat on the back when a job was well done. I even received a hug on special occasions when he was excited about a project that neared completion and others thought it couldn't be done. ...

I have a feeling that from now on it won't surprise me if I feel a light pat on my back when I do a good job and when I turn around, there won't be anyone there.

Gene M. Buchholtz, retired Electronics Technician 6

I believe that Dr. Suomi's greatest asset was his ability to communicate. He could put complex ideas and feelings into a few effective words .... Some examples: 1) He said that the amount of money you receive from a research proposal is inversely proportional to the weight of the proposal,

and he proved it. 2) When he hired me, he told me my job would be to keep him out of jail and financially solvent, *in that order!* 3) The universal forces of nature, according to Dr. Suomi, were defined as Gravity and Greed. He said, if you were fighting either one, you were in big trouble. (And he chose to be a satellite guy and built a house with a flat roof? I guess he enjoyed a little trouble.)

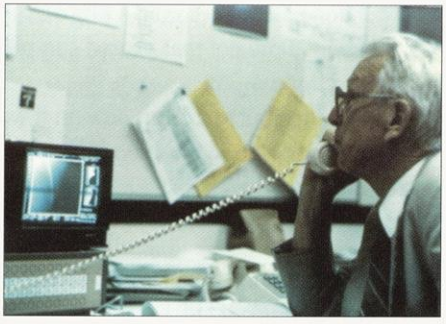
John P. Roberts, Assistant Director

During ingest of the first GOES-8 images here at SSEC (the first and only place to get them, I think), ... I ran off to my office's Sun McIDAS-X UNIX workstation to display the first image.

Shortly after getting an image, folks from all over the building started to pour in, ... and yes, Professor Suomi showed up. He sat down, and started giving me instructions to show him portions of the image. ...

It was an experience I'll never forget—I was showing the man who developed the technology for doing geostationary satellite imagery this! He had me redisplay the images over key points to see how clear the key points were. Afterwards, he got up and commented that this satellite cost more than all of the other satellites built before it. He then thanked me and left.

Matthew A. Lazzara, Research Specialist



During a telephone interview at the Jet Propulsion Laboratory, Professor Suomi views a picture of Neptune sent to Earth by Voyager 2 in August 1989. The picture shows the first cloud shadows on any planet besides Earth; it led to an understanding of Neptune's circulation.

Suomi's Creative Impact

Vital Statistics

Born, 6 December 1915
Died, 30 July 1995
Married Paula Meyer, 1941
Father of Lois, Steven, and Eric

B.S., 1938, Winona Teachers' College, Winona, MN
Hired by Department of Meteorology, University of Wisconsin–Madison (UW–Madison), 1948
Ph.D., 1953, University of Chicago
Chair, Department of Meteorology, UW–Madison, 1950–52, 1954–57
Associate Program Director for Atmospheric Sciences, National Science Foundation, 1962
Chief Scientist, U.S. Weather Bureau, 1964
Founded SSEC, 1965
Began GARP with Jules Charney and Pierre Morel, 1970s
Brought to SSEC a group of researchers from the National Oceanic and Atmospheric Administration (NOAA), 1977
Founded jointly with NOAA, the Cooperative Institute for Meteorological Satellite Studies at SSEC, 1980

Developed flat plate radiometer to measure Earth's heat balance, late 1950s
First meteorological experiment on Explorer VII, 1959
Conceived spin-scan camera technology for geostationary orbit, 1963
Proposed a Visible Infrared Spin-Scan Radiometer Atmospheric Sounder, 1971
Directed development of McIDAS, 1970s
Member, Venus/Mercury Imaging Science Team, 1973
Member, Mariner/Jupiter/Saturn Imaging Science Team
Member, Pioneer Venus Science Steering Group and directed Net Flux Radiometer development, late 1970s
Advised on use of GPS for meteorology, 1990s

"You've certainly gotten a lot of mileage out of freshman physics." According to Dr. Verner Suomi, this was a comment he heard more than once over the course of his career and he was proud of it. Using a unique combination of determination, hard work, inspiration, and those freshman physics, Suomi became known as the "father of satellite meteorology." His research and inventions have radically improved forecasting and our understanding of global weather.

Verner Suomi didn't set out to invent satellite meteorology. In fact, he described his education as "a mess." Growing up in Minnesota, he wanted to be an engineer. But with finances limiting his choices for higher education, he wound up at a teacher's college. After teaching high school science for several years, he enrolled in a Civil Air Patrol course at the start of World War II. There, he got his first exposure to the new field of meteorology.

This new love led him to the University of Chicago, where he continued his meteorology studies and trained air cadets in basic forecasting. By 1948 he was one of the first faculty members in the Department of Meteorology at the University of Wisconsin in Madison, an institution at which he would spend most of the rest of his professional life.

Suomi received his Ph.D. from the University of Chicago in 1953. For his doctoral thesis, he measured the heat budget of a corn field, a subject that Suomi himself admitted was none too glamorous. But measuring the difference between the amount of energy absorbed and the amount of energy lost in a corn field led him to thinking about Earth's heat budget. The obvious way to measure such a thing was to use satellites, which, by the mid-1950s, were emerging as a meteorological tool. "When I first began my work with meteorological satellites, no one in the Department of Meteorology seemed particularly interested; but they didn't try to impede progress in the field for which I'm forever thankful."

By 1959 Suomi's flat plate radiometer was in orbit. Using both satellite observations of the Earth's heat balance and atmospheric cooling rates measured by net flux radiometersondes on weather balloons, Suomi established the important role played by clouds in absorbing radiated

solar energy. These studies set the stage for the full-scale integration of satellites into the field of meteorology.

Suomi and Robert Parent, a professor in electrical engineering, started the Space Science and Engineering Center (SSEC) in 1965 with funding from NASA and the National Science Foundation. SSEC was to become a hotbed of invention and research, and it was where Suomi's most important and lasting innovation, the spin-scan camera, was born.

As early as 1963 Suomi had understood the benefits that could be gained by observing a single weather phenomenon at frequent intervals. But these kind of observations just weren't possible using the existing, low polar-orbiting satellites. Then he read about NASA's new geostationary Advanced Technology Satellite (ATS); 22,000 miles out in space, this satellite would move in an orbit above the equator at the same speed as the Earth spins. For Suomi the spin-scan idea was suddenly simple: "the weather moves, not the satellite."

This "gadget," as Suomi affectionately called all his inventions, allowed scientists to observe weather systems as they developed instead of glimpsing small bits at odd intervals. Satellite sensing technology was suddenly transformed from the production of interesting snapshots into the gathering of meaningful, quantitative data. It is no exaggeration to say that this invention revolutionized satellite meteorology. The weather satellite images that the public around the world sees on the evening news and relies on to protect them from natural disasters are a direct result of Suomi's invention.

Suomi and Parent saw their spin-scan camera launched on ATS-1 in 1966. Mounted aboard the spin-stabilized satellite, the camera scanned a small strip of the Earth with each rotation. By tilting the camera slightly for the next rotation, an image of Earth could be created in less than 30 minutes.

Now it was possible to measure and track air motion, cloud heights, rainfall, even pollution and natural disasters. This technology soon became an operational necessity. It helped to improve the accuracy of forecasting and has saved many thousands of lives over the years. While the original spin-scan design is no longer in use in the United States,

Committees

The committees on which Professor Suomi served are listed alphabetically by organization. Where the parent organization is known, it is given first in bold. Years in which Professor Suomi served are given where known. Unless otherwise mentioned, committees are based in the United States. This list is not comprehensive. "Committee" is abbreviated.

American Academy of Arts and Sciences
Council Nominating Comm., 1982–1984

American Meteorological Society
President, 1967
Planning Commission, 1981–1985
Education and Manpower Commission, Ad Hoc Comm., 1985

Committee On Space Research
Working Group VI, Panel A on Weather and Climate, 1973–1974

Global Atmospheric Research Program
U.S. Committee for the Global Atmospheric Research Program, Joint Organizing Comm., Chair, 1969–?

Joint Scientific Committee
Comm. on Climatic Changes and the Ocean, Working Group on Satellite Observing Systems for Climate Research

National Academy of Sciences
Interdepartmental Comm. on Atmospheric Sciences (ICAS), Select Panel on Weather Modification, 1965–?
Geophysics Film Committee, 1981–1984
Comm. on Science Engineering and Public Policy (COSEPUP), Research Briefing Panel on Atmospheric Sciences, 1982–?

National Advisory Committee on Ocean Atmosphere
Chair, 1971

National Aeronautics and Space Administration
Science and Mission Requirements Working Group for System Z, 1983(?)–?

Earth Observing System Science Steering Comm., 1984(?)–?
NASA/University Relations in Space Science Study Group, 1984
Space and Earth Sciences Advisory Comm., Task Force on the Scientific Uses of Space Station, 1984-1985

National Center for Atmospheric Research
Chair, Panel on Scientific Use of Balloons, 1961–1964

National Oceanic and Atmospheric Administration
Joint U.S./People's Republic of China Working Group on the Atmospheric Protocol, 1979–1981

National Research Council
Geophysical Research Forum
Board on Atmospheric Sciences and Climate (BASC), NOAA Review Panel
Commission on Physical Sciences, Mathematics and Resources, BASC, Panel on Climate-Related Data, 1982–1985
Space Applications Board, Comm. on Practical Applications of Remote Sensing from Space, 1983–1984

National Science Foundation
Advisory Panel on Weather Modification, 1959–1964

University Corporation for Atmospheric Research
Mesoscale Steering Comm., National STORM Program, 1981
Board of Trustees, 1982–1985
Board of Trustees Budget and Program Comm., 1986
Board of Trustees Executive Comm., Member-at-Large, 1986
UNIDATA Steering Committee
UNIDATA, Local Hardware-Software System (LOHSS) Working Group, 1985–?

University of Alaska
Geophysical Institute, Advisory Board, 1984–1986

University of Wisconsin–Madison
Library Comm., 1964–1966 (Chair, 1966)
Dept. of Meteorology, Curriculum Comm., 1966–1970

World Meteorological Organization
JSC/CCCO Working Group on Satellite Observing Systems, 1987(?)–?

Suomi's basic concept has been adopted for many satellites and space probes. These were built for NASA and the National Oceanic and Atmospheric Administration, as well as the European Space Agency and the Japanese Meteorological Agency.

By 1967 the spin-scan pictures were in color and by 1971 work had begun on an instrument that would profile the atmosphere's temperature and water vapor from geostationary satellites. The Visible-Infrared Spin-Scan Radiometric Atmospheric Sounder (VAS) was a modification of the original spin-scan design with additional detectors for the proper spectral bands. By observing temperature and moisture structures, Suomi hoped to improve the prediction of severe weather.

When the VAS was finally launched in 1980 aboard the GOES-4 satellite, it performed with the accuracy Suomi had predicted in his original 1971 proposal. The geostationary sounder remains the only instrument able to observe severe storms over regions of hundreds of thousands of square miles. Suomi's work proved both the need for sounders and their feasibility. This technology is continued today with the GOES-8, -9 and -10 sounder instruments.

With the advent of these new tools, the flow of meteorological data quickly became an overwhelming flood. Experiments conducted under the Global Atmospheric Research Program (GARP) added to the already vast amount of data. To make sense of all this, or as he put it, to try "to get a drink from a fire hydrant," Suomi became the driving force behind the development of a computer system that could gather and handle the vast amount of imagery and data.

The Man-computer Interactive Data Access System (McIDAS), like so many of his ideas, just popped into his head. As he watched a football game on television, he realized that what he really wanted was an "instant replay of weather pictures." He wanted to slow them down, replay them, and have a computer analyze them. With this simple concept, he went to SSEC's engineers and programmers. In 1972 Suomi introduced McIDAS.

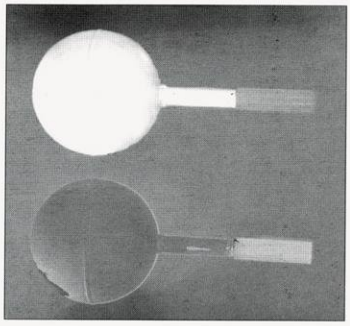
McIDAS proved invaluable in analyzing wind data collected during the First GARP Global Experiment (FGGE) in 1978. Instrumental in

planning the experiment's objectives and processes, Suomi came up with the idea of using observed cloud movement to determine wind speed and direction, especially over the tropics. McIDAS is in use today by the National Storm Prediction Center, the National Weather Service, the National Transportation Safety Board, NASA Goddard Space Flight Center, and many other government agencies and private companies, including meteorological centers in Spain, Australia and Japan.

Dr. Suomi's interest in satellite meteorology wasn't confined to Earth. After developing ways to measure Earth's atmospheric circulation, it seemed a natural extension to apply this technology to space probes. He was involved in the exploration of Venus, Jupiter, Saturn, and Uranus. Dr. Suomi and other scientists at SSEC designed and built net flux radiometers and other instruments that were used aboard the Pioneer probe to Venus in 1978 and on other probes.

While Dr. Suomi was indeed "a giant of modern science," as UW–Madison Provost John Wiley described him, he never let his intellect stand in the way of communicating clearly. He was first and foremost a teacher, able to explain difficult concepts clearly and without condescension. The list of his former students reads like a "Who's Who" of the younger generation of meteorologists. His enthusiasm and encouragement may yet have a far greater impact than his monumental achievements.

Russell Hall, Editor, SSEC



The difference in temperature between the two balls is a measure of the radiation absorbed by Earth's atmosphere. This simple meteorological experiment was the first to fly on any satellite. Knowledge received from it is basic to an understanding of the Earth's heat budget.

Publications

Copies of publications can be obtained from The Schwerdtfeger Library, 1225 W. Dayton St., Madison, WI 53706 or via e-mail: jean.phillips@ssec.wisc.edu. Works on which Professor Suomi appears as first author are listed first. This is a comprehensive list of Verner Suomi's publications, with these exceptions: It does not include final reports upon which are based articles in juried publications (such as the Bulletin of the American Meteorological Society*). Nor does it include reports in which Professor Suomi is listed only as principal investigator. Most proposals are also omitted.*

To present as many publications as possible, we took slight liberties with AMS style, such as the following: Organizations, such as the National Aeronautics and Space Administration or the Space Science and Engineering Center, are abbreviated—NASA or SSEC—including in titles. We also eliminated spaces between initials—V. E. becomes V.E.

To obtain a complete list, without these innovations and in a larger type size, please write Terri Gregory, SSEC, 1225 W. Dayton St., Madison, WI 53706, or e-mail terri.gregory@ssec.wisc.edu.

Suomi, V.E., n.d.: ATS-I Spin Scan Cloud Camera Experiment in Japan [16 mm film, b/w]. Meteorological Research Institute of Japan and the Radio Research Laboratory of Japan, 5 min.

—N.d.: Detailed views of mesoscale cloud patterns filmed from ATS-I [16 mm film, silent, color]. T.T. Fujita, and W.A. Bohan, producers. National Aeronautics and Space Administration (NASA) and Environmental Science Services Administration (ESSA), 9 min.

—N.d.: The radiation balance of the Earth from a satellite. [NSF USNC IGY Project 30.11].

—1953: The heat budget over a cornfield. Ph.D. thesis, University of Chicago.

—1956: Energy budget studies at the earth's surface and development of the sonic anemometer for power spectrum analysis. Department of Meteorology, UW–Madison, various paging.

—1957: Double-psychrometer lift apparatus: UW. *Exploring the atmosphere's first mile, Vol. 1.* Pergamon Press, 183-187.

—1957: Heat storage variations: UW. *Exploring the atmosphere's first mile, Vol. 1.* Pergamon Press, 79-80.

—1957: Radiation measurements. *Exploring the atmosphere's first mile, Vol. 1.* Pergamon Press, 81-82.

—1957: Soil temperature integrators: UW. *Exploring the atmosphere's first mile, Vol. 1.* Pergamon Press, 24.

—1957: Sonic anemometer: UW. *Exploring the atmosphere's first mile, Vol. 1.* Pergamon Press, 256-266.

—1957: UW net radiometer. *Exploring the atmosphere's first mile, Vol. 1.* Pergamon Press, 95-98.

—1961: Differential cooling from satellite observations. *Proceedings of the International Meteorological Satellite Workshop,* Washington, DC, NASA and US Dept. of Commerce, Weather Bureau.

—1962: Observing the atmosphere–a challenge. *Proc. of the IRE,* **50,** 11, November, 2192-2197.

—1966: Letter to Sigmund Fritz, Director of Meteorological Satellite Laboratory, National Environmental Satellite Center, ESSA. Madison, WI.

—1966: A proposal to ESSA, Dept. of Commerce for continuation of studies in atmospheric energetics based on aerospace probings: January 1, 1966–December 31, 1968. Weather Bureau—ESSA proposals. Dept. of Meteorology, UW–Madison, 15 pp.

—1968: Letter to John E. Naugle, NASA. Madison, WI (SSEC).

—1968: Proposal to NASA for a comprehensive research program in space applications for meteorology using satellites. NASA science proposals. SSEC, UW–Madison, 10 pp.

—1969: Recent developments in satellite techniques for observing and sensing the atmosphere. *The Global Circulation of the Atmosphere.* Royal Meteorological Society, 222-234.

—1971: Meteorological instrumentation. *Encyclopedia of Science and Technology.* McGraw-Hill.

—1972: The acquisition of meteorological data. *Meteorological Challenges: A History.* Information Canada, 159-177.

—1973: Constant level balloon sub-system for the southern hemisphere. SSEC, UW–Madison, Madison, WI.

—1975: Atmospheric research for the nation's energy program. *Bull. Amer. Meteor. Soc.,* **56,** 10, October, 1060-1068.

—1975: Cloud motions on Venus. *Conference on The Atmosphere of Venus.* New York, NY, National Aeronautic and Space Administration, 42-58.

—1975: GARP: Dreams into realities. *Review of Space Science Astronautics and Aeronautics,* October, 14-16, 76.

—1975: Man-computer Interactive Data Access System (McIDAS): Continued development of McIDAS and operation in the GARP Atlantic Tropical Experiment. Final report Contract NAS5-23296 for period August 1973 to December 1974. SSEC, UW–Madison.

—1975: A proposed radiation parameterization scheme for climate models. The physical basis of climate and climate modelling: *Report of the International Conference in Stockholm,* Geneva, World Meteorological Organization (WMO), Global Atmospheric Research Programme (GARP), 181-182.

—1976: Wind determination from geostationary satellites. *Proc. Symposium on Meteorological Observations from Space: Their Contribution to the First GARP Global Experiment,* Philadelphia, PA, COSPAR, World Meteorological Organization (WMO), 188 pp.

—1977: The need for climate monitoring. *Energy and Climate.* National Academy of Sciences, 128-132.

—1980: Short-term forecasting and services. *The Atmospheric Sciences: National Objectives for the 1980s.* National Academy of Sciences, 64-68.

—1981: The impact of meteorological satellites on FGGE. *International Conference on Early Results of FGGE and Large-Scale Aspects of its Monsoon Experiments,* Tallahassee, FL. WMO, (1-4)–(1-10).

—1981: The role of satellites in the study of the ocean surface energetics. *Workshop on Applications of Existing Satellite Data to the Study of the Ocean Surface Energetics,* Madison, WI, SSEC, UW–Madison, 3-4.

—1982: Preparation of a composite surface stress data set for the Summer Phase of MONEX. Final project report. National Science Foundation Atmospheric Science Programs Grant ATM 7913097, 15 October 1979–30 November 1981. SSEC, UW–Madison, Madison, WI.

—1985: Some possibilities on an observing system for the world climate. *Monitoring Earth's ocean, land, and atmosphere from space: Sensors, systems, and applications.* (Abraham Schnapf. Progress in astronautics and aeronautics series.) American Institute of Aeronautics and Astronautics, 305-346.

—1992: Aqua and the planet, GEWEX and the role of TRMM. *The global role of tropical rainfall: Proc., International Symposium on Aqua and Planet.,* Tokyo, A. Deepak Publishing, 15-31.

Suomi, V.E. and R.J. Parent, n.d.: A proposal to the NASA for a supplement to contract NAS 5-9677 for research and development on a ground station system for the spin-scan camera. NASA ATS proposals. Dept. of Meteorology, UW–Madison, 10p., figures, appendixes.

—N.d.: A simple high capacity digital output data storage system for space experiments. 9 pp.

—1964: Initial proposal to NASA for an ATS technological experiment. NASA ATS proposals. Dept. of Meteorology, Dept. of Electrical Engineering, UW–Madison, 4 pp., figures.

—1964: Studies in atmospheric energetics based on aero-space probings (Contract WBG-10). Dept. of Meteorology, UW–Madison, 66 pp.

—1966: A proposal to the NASA for color spin scan camera for ATS-C. NASA ATS proposals. SSEC, UW–Madison, 12 pp., figures, appendixes.

—1968: A color view of planet earth. *Bull. Amer. Meteor. Soc.,* **49,** 2, February, 74-74.

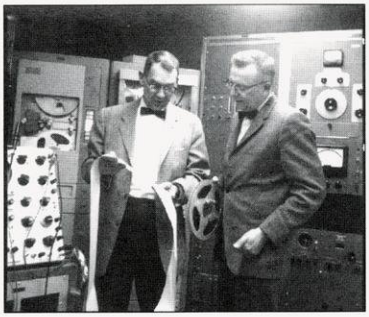
Suomi, V.E., and P.M. Kuhn, 1956: Energy budget data: Project Prairie Grass, O'Neill, Nebraska, July-August 1956. Dept. of Meteorology, UW–Madison, 14 pp.

—1957: Annual report for the study of differential heating of air columns. Dept. of Meteorology, UW–Madison, various paging.

—1958: An economical net radiometer. *Tellus,* **10,** 1, February, 160-163.

—1960: A note on the "Use of an economical thermal transducer as a net radiometer." *Bull. Amer. Meteor. Soc.*, **41,** 1, January, 32.

—1964: Balloon-borne radiometersonde. *Annals of the International Geophysical Year, Vol. 32: Meteorology.* Pergamon Press, 81-86.



Professor Suomi (right) reviews satellite data with Professor Parent, in the 1960s. At that time, the data were received on an analog data recording system.

Suomi, V.E. and C.B. Tanner, 1958: Evapotranspiration estimates from heat-budget measurements over a field crop. *Transactions, American Geophysical Union,* **39,** 2, 298-304.

Suomi, V.E., and W.C. Shen, 1963: Horizontal variation of infrared cooling and the generation of eddy available potential energy. *J. Atmos. Sci.*, **21,** 1, 62-65.

Suomi, V.E., and W.P. Birkemeier, 1965: A study of the lower atmosphere using scattering of microwaves (NSF Grant GP667). Dept. of Meteorology, UW–Madison, various paging.

Suomi, V.E., and K.J. Hanson, 1968: Weather in motion. SSEC, UW–Madison, various paging.

Suomi, V.E. and S.K. Cox, dir., 1969: 1968 Barbados experiment movie—May, June, and July [16 mm, b/w]. ESSA, BOMEX Project Office, 12 min.

—1970: The study of radiation in a tropical atmosphere (ESSA Grant E22-60-69G). Dept. of Meteorology, UW–Madison, 100 pp.

Suomi, V.E. and T.H. Vonder Haar, 1969: Geosynchronous meteorological satellite. *Journal of Spacecraft and Rockets,* **6,** 3, 342-34.

—1972: Reply to "Comments on measurements of the earth's radiation budget from satellites during a five-year period." *J. Atmos. Sci.*, **29,** 3, 602-607.

Suomi, V.E., and K.J. Buress, 1971: Technical report on a prototype Boundary Layer Instrumentation System: Final report (part 3) on the Boundary Layer Instrumentation. Study. SSEC, UW–Madison, 60 pp.

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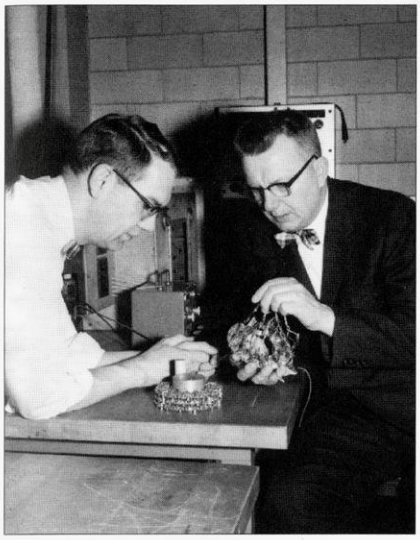

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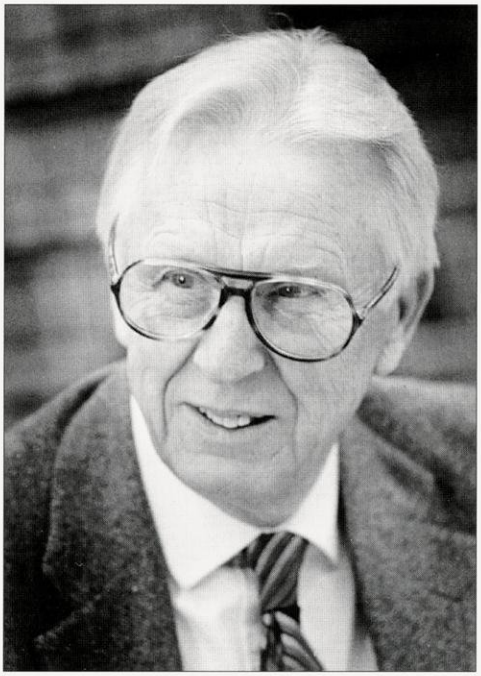

I often say, rock the boat.
But before you rock it, do three things:
measure the freeboard on the boat,
notice the state of the sea,
and the distance to shore.
Only then rock the boat.

Verner E. Suomi, 1988

Space Science and Engineering Center · 1225 W. Dayton Street · Madison, WI 53706 · USA

UNIVERSITY OF
WISCONSIN
MADISON

FOR IMMEDIATE RELEASE 1/23/98
CONTACT: Rosalyn Pertzborn, 265-4160; Sanjay Limaye, 262-9541

Space – Space Sci / Eng.

OUT-OF-THIS-WORLD EXPERIENCE FOR MIDDLE SCHOOL STUDENTS

MADISON - With the successful launch of the Space Shuttle Endeavour Thursday evening (Jan. 22) for its docking and transfer mission, it carries into space a camera that takes pictures of unique geographical areas on Earth. On Earth, 7th and 8th graders will activate the camera and focus on these special areas to learn more about them.

Only two Midwest schools, Madison middle schools Velma Hamilton and Spring Harbor, are taking part in this EarthKAM mission. EarthKAM stands for Earth Knowledge Acquired by Middle schools. Scientist Sanjay Limaye and Outreach Coordinator Rosalyn Pertzborn of UW-Madison's Space Science and Engineering Center are shepherding schools from setup through completion of the STS-89 EarthKAM flight. James Kotoski, a seventh-grade science teacher at Spring Harbor is the lead teacher; Julie DeWitt, Learning Coordinator at Hamilton, works with the students at her school.

Earlier in January, student participants simulated four orbits of a shuttle flight. Sanjay Limaye explained, "We pretended that the shuttle was in orbit, viewed Web pages, and exchanged information between the Student Mission Operations Centers (SMOCs) and the University of California, San Diego (UCSD), where the project is managed. We performed other tasks we will perform during the flight."

For their target observations, Hamilton and Spring Harbor students will focus on the impact of human activity on the Amazon Rain Forest. Hamilton middle school students will also look at active volcanoes, particularly Soufriere Hills in Montserrat.

Providing the technology boost for Madison's participants is TDS Telecom, a national telecommunications company based in Madison. Joe Keyes, in TDS' government regulatory affairs office, said, "This is a nice win-win project for everybody. It's a nice blending of our subsidiaries' capabilities, in that TDS Metrocom provided telephone lines and TDSNet gave Internet access."

EarthKAM was started as KidSat by the first U.S. woman astronaut, Sally Ride, now a Physics professor at UCSD. EarthKAM observations are integrated into school curriculums in earth sciences with activities in math, science, oral and written communication, research, computer use, and team work activities.

EarthKAM is funded by NASA and is a collaboration of the University of California at San Diego (UCSD), Johns Hopkins University's Institute for the Academic Advancement of Youth (IAAY), and the Jet Propulsion Laboratory (JPL) which also funds global mosaics of satellite imagery created by SSEC. Madison's Evjue Foundation partially supports EarthKAM and other outreach efforts at SSEC, and NOAA scientists at SSEC are helping students with their Amazon research.

Madison schools' EarthKAM activities can be tracked over the Internet at these Web sites: Spring Harbor:
http://www.madison.k12.wi.us/stugeon/kidsat.htm

Velma Hamilton: http://www.madison.k12.wi.us/hamilton/earthkam.htm
###
- Terri Gregory, SSEC, (608) 263-3373

Space Science Engineering

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NEWS

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FOR IMMEDIATE RELEASE 1/24/97

CONTACT: Christopher Moeller, (608) 263-9597; Paul Menzel, (608) 263-4930; Terri Gregory, (608) 263-3373

FORMER SPY PLANE MAY REVEAL THE SECRETS OF CLOUDS

MADISON — Using a converted spy plane to take their experiment to the very top of the atmosphere, scientists hope to learn the secrets of winter clouds.

For three weeks, beginning Friday (Jan. 24), scientists from the University of Wisconsin-Madison's Space Science and Engineering Center and NASA will conduct a high-flying experiment out of Madison's Truax Field to map, measure and probe winter clouds over North America.

Known as WINCE for Winter Cloud Experiment, the set of observations will be made with the help of a NASA ER-2, a high-flying aircraft that, in a former life, was a spy plane. Its payload of six scientific instruments will give scientists a more certain understanding of the role clouds play in regulating climate. In addition, the experiment will serve as a critical testbed for instruments that will be flown on a constellation of Earth-observing satellites that NASA plans to launch over the next decade.

"Our objective is to study clouds in a way that will further our ability to study climate," said UW-Madison atmospheric scientist Christopher Moeller. "Clouds regulate the Earth's atmosphere. They have a fairly significant impact on the Earth's radiation balance."

The experiment depends on a relic of the Cold War, an ER-2 aircraft that once, as a U-2 spy plane, conducted high-flying espionage missions on behalf of the United States. It achieved fame and notoriety as the aircraft piloted by Francis Gary Powers, the U.S. pilot shot down and held captive by the Soviet Union in 1960 during the height of the Cold War.

But the planes, two of which have been retired from the spy business and rechristened as ER-2s, have become scientific workhorses, used by NASA since the 1970s as high-altitude platforms for scientific instruments.

For the WINCE experiment, the aircraft will be loaded with a suite of four different sensors and two camera systems, and flown above 95 percent of the Earth's

-more-

atmosphere to get a detailed picture of clouds over the winter landscape of the northern United States and southern Canada.

Clouds play a critical role in climate, both blanketing the Earth and keeping energy in, and reflecting incoming energy from the sun back into space. But the subtleties of their influence on climate and their overall role in the climate puzzle is not well understood, said Paul Menzel, a National Oceanic and Atmospheric Administration scientist stationed at UW-Madison's Space Science and Engineering Center.

"What we've been doing for some time is trying to understand the influence of clouds on the radiation budget of the Earth," said Menzel. "The question we're trying to answer is how much blocking do these clouds do?"

According to Moeller, one important way to approach that question is to obtain a better understanding of cloud microphysics by learning more about the size and shape of the tiny water droplets that make up clouds.

The experiment, says Menzel, is deliberately difficult: "We picked the winter because it is more challenging" to detect and measure clouds, especially cirrus clouds.

These high-altitude clouds, delicate wisps, patches and narrow bands composed of ice crystals, are hard for satellites to detect against the backdrop of a snow-covered Earth, Menzel said.

Moreover, surveying and assaying clouds in northern regions adds to the big picture of cloud influence on global climate, said Moeller.

"We need to know if clouds are increasing in cold regions as well as warm regions," said Moeller. "We need to know what's happening in different climate regimes. We would like to paint this big picture of what's going on on a global scale."

The question of clouds' role in climate is confounded by human influence on the atmosphere as pollutants such as carbon dioxide may be changing the equation, said Moeller. "We would like to get at that bottom line, but we know the answer may not be so simple. We know it's a question that's going to be researched for decades to come."

In addition to NASA and UW-Madison, others supporting and participating in the experiment include: the 115 Fighter Wing of the Wisconsin Air National Guard which is providing facilities and support for the ER-2 aircraft; Madison-based Persoft, Corp., a software development company that is providing a wireless communications network to facilitate data transfer between Truax Field and UW-Madison's Space Science and Engineering Center.

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— Terry Devitt, (608) 262-8282, trdevitt@facstaff.wisc.edu

UNIVERSITY OF WISCONSIN MADISON

Space Science Engineering Center

Winter Cloud Experiment (WINCE)
University of Wisconsin-Madison
Space Science and Engineering Center

FACTS

The Experiment: The Winter Cloud Experiment is an attempt to learn more about the detection and properties of clouds in northern regions. Clouds play an important role in regulating climate. Scientists would like to learn more about the specific physical properties of clouds and how they trap or deflect energy thereby influencing the energy budget of the Earth. Wisconsin scientists are especially interested in the microphysical properties of clouds, in particular the size and shape of the tiny water droplets and ice particles that make up clouds. The WINCE experiment is also a test for prototype instruments that will one day be critical components of a series of satellites that will make up NASA's Earth Observing System.

The Timetable: The duration of the experiment will be from Friday, Jan. 24 to Thursday, Feb. 13. During that window, approximately 10 flights of a NASA ER-2 research aircraft will occur out of Madison's Truax Field. **Note:** Weather could be an important factor in the execution of the experiment and planned flights may not occur if conditions are such that they would interfere with the experiment or pose a hazard to the ER-2 aircraft, its crew or the suite of WINCE instruments.

The Aircraft: The WINCE experiment depends on a NASA ER-2 aircraft as a platform to fly a set of six instruments above 95 percent of the Earth's atmosphere. The ER-2, built by Lockheed, was developed as a high-flying reconnaissance aircraft for the U.S. military. The military version is known as the U-2. Two U-2s exist in NASA's fleet and have been rechristened ER-2 for Earth Resources. The plane can achieve altitudes of 20 kilometers, making it an ideal platform for scientific instruments engaged in atmospheric or other earth science research.

The Payload: Housed in the fuselage and in two wing pods will be a suite of six scientific instruments designed to detect and sample upwelling radiation from clouds. In addition to two camera systems to photo document the clouds being studied are an interferometer, a microwave imaging radiometer, a cloud Lidar system and a spectrometer known as MAS, a simulator for a multispectral scanner that dissects upwelling radiation into its component spectra.

The Players: The WINCE experiment is being coordinated by the University of Wisconsin-Madison's Space Science and Engineering Center with support from the National Aeronautics and Space Administration (NASA). Aircraft facilities and support are being provided by the 115 Fighter Wing of the Wisconsin Air National Guard. Madison-based Persoft, Corp. is providing specialized wireless technology to facilitate data exchange between Truax and the UW-Madison Space Science and Engineering Center five miles away.

For More Information: Terry Devitt, UW-Madison Office of News and Public Affairs, 608-262-8282, trdevitt@facstaff.wisc.edu; Terri Gregory, UW-Madison Space Science and Engineering Center, 608-263-3373, terri.gregory@ssec.wisc.edu; Terri Hayes, Persoft Corp, 608-273-6000, hayes@persoft.com

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Space Science Engineering

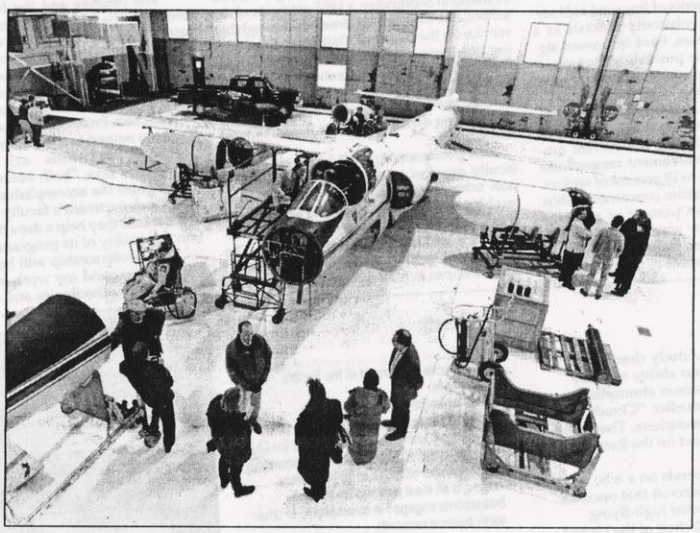
WISCONSIN WEEK
January 29, 1997
For Faculty & Staff
University of Wisconsin-Madison

Inside

Spies like us

NASA plane flies from cold war to cold weather

— Terry Devitt



Jeff Miller

Scientists from the Space Science and Engineering Center show off their latest weapon in weather research — a high-flying NASA plane that was formerly used as a spy plane by the U.S. military. The plane will soar above Madison in coming weeks, analyzing winter clouds.

Using a converted spy plane to take their experiment to the very top of the atmosphere, scientists hope to learn the secrets of winter clouds.

For three weeks, beginning last Friday, scientists from the Space Science and Engineering Center and NASA will conduct a high-flying experiment out of Madison's Truax Field to map, measure and probe winter clouds over North America.

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see CLOUDS, page 6

Survey: Most students would come again

Jeff Iseminger

In the fourth annual survey of student satisfaction at the UW-Madison, 91 percent of undergraduates say they are satisfied — 39 percent report they are extremely satisfied and 52 percent say they are satisfied.

That satisfaction rate compares to 86 percent in the 1995 survey, 87 percent in 1994 and 91 percent in 1993.

The phone survey of a randomly selected sample of 1,229 undergraduates was conducted last fall by the University of Wisconsin Survey Center.

When asked if they would enroll at UW-Madison if they had it to do all over again, 90 percent of the students said they would. That figure was 89 percent in 1995, 90 percent in 1994 and 89 percent in 1993.

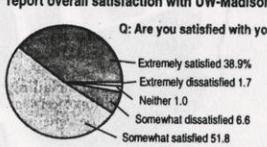
"UW-Madison is one of a very few universities that regularly and systematically asks its students to assess how it is performing and where things need improvement," says James Sweet, lead researcher on the project, UWSC director an d professor of so-

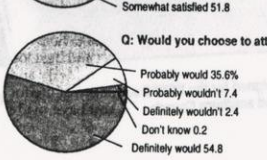
see SATISFACTION, page 6

Jeff Miller

An air of satisfaction

For the fourth year, more than 85 percent of undergraduate students report overall satisfaction with UW-Madison. Among the results:





Flexible program may bring more into honors

Barbara Wolff

Sweeping curricular changes planned for the College of Letters and Science Honors Program ideally will bring more and different students into the program.

Scheduled to take effect this fall, the changes also are intended to improve program quality, according to L&S honors director William Cronon, Frederick Jackson Turner Professor of History, Geography and Environmental Studies.

Since the program's inception in 1959, incoming freshmen typically enrolled in Honors based on their high school grades and standardized test scores. Accumulating 40 credits from honors course work, maintaining a minimum grade point average of 3.3, and often researching and writing an honors thesis during their senior year to date has earned the undergraduate honors degree.

However, Cronon notes several problems with that approach. "Relatively few students choose to embark on honors-level work after their freshmen year, even though many students would be qualified to do so," he says. Consequently, Cronon says departments sometimes have trouble filling honors courses, especially at junior and senior levels, because the pool of students eligible to take them is relatively small.

To improve the situation, members of the L&S Honors Committee spent the last year revising the college's honors options. Recently finalized are three new possibilities.

• Honors in the Liberal Arts, 24 credits of broadly distributed honors courses in introductory and intermediate general courses. Says Cronon, "Unlike the existing Sophomore Honors, these credits may be earned anytime during an undergraduate's career. This degree will be much more accessible to 'late blooming' students who decide to undertake an honors degree after the freshmen year."

According to Maree Elowson,

see HONORS, page 4

SATISFACTION

from page 1

ciology. "The administration and those responsible for providing student services take these assessments very seriously as they set priorities and seek to improve educational programs and student life."

In terms of overall quality of instruction, 63 percent of undergraduates say it is excellent or very good, up from 56 percent in 1995 and close to the 64 percent of 1993. Out-of-classroom accessibility of instructors in 1996 is ranked as good, very good or excellent by 86 percent of the students, compared to 83 percent in 1993.

Eighty-three percent of students rate their teaching assistants as excellent, very good or good, the same percentage as in 1993. Of those who have had experience with non-native-English-speaking TAs, 61 percent ranked them as excellent, very good or good, while the figure in 1993 was 60 percent.

As in previous surveys, undergraduates ranked several university services. Most of them continued to receive a positive response (good through excellent) of 90 percent or higher.

Student assessments of financial aids services, targeted by university officials as a priority in recent years, have improved significantly. In 1993 the positive-response rating of financial aids services was 67 percent; last fall that figure was 77 percent.

Based on a new question asked in 1996, one student in seven reports being involved in faculty research during the current academic year. Their involvement ranges from 7 percent of freshmen to 18 percent of seniors.

Another new question concerned public service. Twenty-seven percent of students report they have done some volunteer service this academic year, including 19 percent of the men and 35 percent of the women.

Alumni couple finds the gift of giving

Computer sciences, Education reading program reap benefits

Lynne Johnson
University of Wisconsin Foundation

Rather than exchanging traditional gifts for their 41st wedding anniversary recently, UW alumni John and Tashia Morgridge instead decided to endow two chairs at the UW-Madison.

Tashia's gift to John was a $1.6 million chair in computer sciences in the College of Letters and Science, while John's gift to Tashia was a $1.6 million chair in reading in the School of Education.

The gift to the School of Education will be used to create the nation's first endowed chair in the field of reading. Tashia Frankfurth Morgridge, a 1955 graduate of the school, has maintained close ties through her service on the Board of Visitors and by helping students prepare to become teachers through scholarship funds she and John have provided. Now retired as a special education teacher, she works as a volunteer teacher for the learning disabled and has written a book on learning.

The professorship will be awarded to a faculty member in curriculum and instruction who has demonstrated outstanding teaching and research in reading and literacy, is actively engaged in training future teachers and is committed to public service. The department began a nationwide search last fall and hopes to fill the position by fall 1997.

The gift — the school's largest ever from an individual donor — comes at a crucial time for faculty and students in reading. Once considered a national leader in instruction and research, the reading program has lost key faculty in recent years. Professors Richard Smith, Wayne Otto and Kenneth Dulin (now deceased) retired, and last October, Professor Thomas Barrett died, leaving the program without a senior faculty member.

"Faculty like these leave a void that is not easily filled," says Charles Read, the school's dean. "The Morgridge professorship will be the pivotal step in rebuilding the reading area, and restoring it to its place as a first-rate program."

The professorship will provide the recipient with an annual auxiliary teaching and research allocation for supplies, equipment, research assistance, salary supplementation and travel.

"The prestige and the funding that accompany the Morgridge professorship will attract attention all over the country," Reads says. "It will allow us to hire the very best teacher and scholar available."

The John P. Morgridge Professor of Computer Sciences is the department's first endowed chair. Professor Lawrence Landweber has been named to the professorship.

"Such positions are important," Landweber says, "both because they serve to recognize the accomplishments and stature of a department's faculty and students, and because they help a department to maintain the quality of its programs.

"The professorship will help me to continue and expand my work involving new networking technologies and their application to supporting new means for p collaborate and communicate," La says. "Of particular interest is the tion of the use of network-based c cation to enhance learning, both at versity and K-12 levels."

Internationally known for his w the Internet, Landweber chairs the I The Internet Society, a non-govern international organization establis 1992 to seek global cooperation and nation for the Internet. He recentl named to head the Advisory Commi the Internet 2 project, which will imp the next-generation Internet for resear versities. Landweber adds that "it is a timidating to have a professorship after someone with John's accom ments."

John Morgridge graduated in 195 the School of Business and has had a successful career in the computer ind He joined Cisco Systems, Inc. in 1988 as dent and CEO. The San Jose, California pany is the leading global supplier of puter networking products. He was hon in 1991 as a Distinguished Business A nus and received an honorary doctorat gree at the UW in 1994. He is a memb the board of trustees of the Wisconsin Al Research Foundation.

John and Tashia Morgridge are mem of the UW Foundation, The Bascom Hil ciety and the Wisconsin Alumni Associat Further evidence of the couple's genero can be seen throughout campus f Morgridge Auditorium in Grainger Hal the lakefront, where the Red Gym, w renovated, will house the Morgridge Ce for Community Service.

CLOUDS

from page 1

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The 115 Fighter Wing of the Wisconsin Air National Guard is providing facilities and support for the ER-2 aircraft; Persoft, Corp. is providing a wireless network to facilitate data transfer between Truax and the Space Science and Engineering Center.

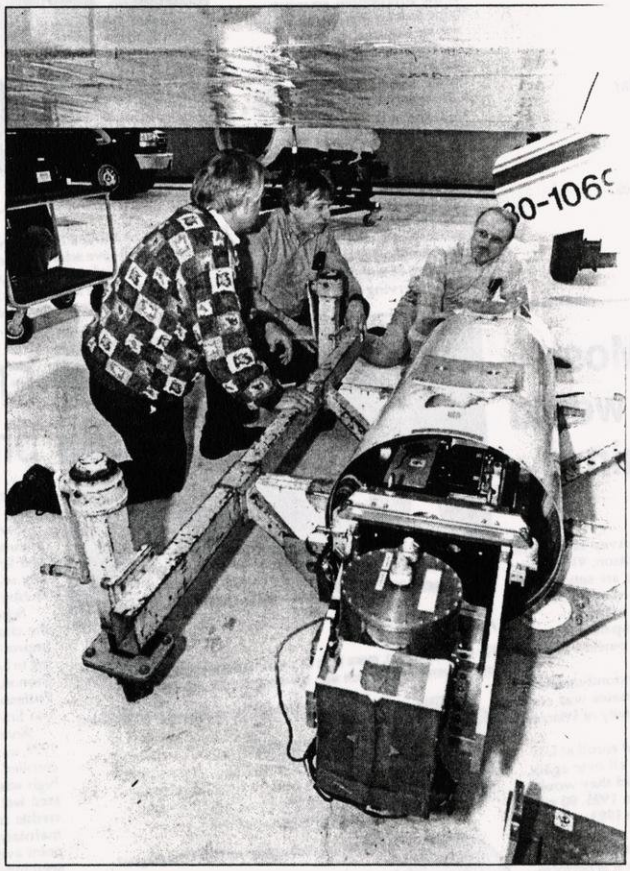
The Aircraft:

NASA ER-2

- Flies above 95 percent of the Earth's atmosphere.
- Built by Lockheed as a high-flying reconnaissance aircraft for the U.S. military.
- Commonly known in military use as the U-2.
- Rechristened ER-2 for Earth Resources.
- Can achieve altitudes of 20 kilometers, making it an ideal platform for scientific instruments engaged in atmospheric or other earth science research.

The Payload:

- Two camera systems
- An interferometer
- A microwave imaging radiometer
- A cloud Lidar system
- A spectrometer known as MAS, a simulator for a multispectral scanner that dissects upwelling radiation into its component spectra.



Jeff Miller

The aircraft's equipment — specially designed for the WINCE experiment — will capture details of clouds over the nothern United States and southern Canada.

Space Sciences Engineering Center

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NEWS

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HOLD FOR OCT. 24, 1996 RELEASE

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THE WINDY PLANET
OBSERVATIONS YIELD A NEW VIEW OF NEPTUNE'S WILD WEATHER

TUCSON, Ariz. — A new view of Neptune's wild weather, where winds whip around the equator at speeds of nearly 900 mph, has been captured by NASA's Hubble Space Telescope and the space agency's Infrared Telescope Facility in Hawaii.

A team of scientists led by Lawrence Sromovsky of the University of Wisconsin-Madison's Space Science and Engineering Center made simultaneous observations of Neptune with both telescopes, providing high-resolution images of the clouds on a planet whose weather is among the most baffling in the solar system.

The new results, and a time-lapse movie showing a full 16.11-hour rotation of the distant planet, were presented here today at the annual meeting of the Division of Planetary Sciences of the American Astronomical Society.

The new view of Neptune, scientists hope, will provide fresh insight into the extraordinary weather on the eighth planet from the sun. The new results, says Sromovsky, will permit a comparison of details sent back to Earth by the Voyager probe seven years ago when some of the first details of Neptune's tempestuous weather were relayed back to Earth.

At the time, scientists obtained their first detailed insights into Neptune's weather, characterized by a powerful equatorial jet stream and storms that dwarf the Earth's most

-more-

violent storms. One intriguing Voyager discovery, the Great Dark Spot, was a pulsating storm feature the size of the Earth that has since disappeared.

Sromovsky's team reports the observation of another dark spot in Neptune's northern hemisphere, but this may be the same feature observed last year by an MIT team. The new, more closely-spaced observations should enable scientists to tease out more details of Neptune's weather and obtain clues about the unknown forces that drive it.

The cause of Neptune's blustery weather is an enigma, said Sromovsky. On Earth, winds are driven by the sun's energy, which heats the atmosphere and oceans. On planets farther from the sun, like Neptune where the sun is 900 times dimmer, winds should be weaker.

"But despite its weak energy input from the sun and its own weak internal heat flux, Neptune's weather is among the most dynamic in the solar system with changes occurring on time scales ranging from minutes to decades," Sromovsky said.

By using both Hubble and the NASA Infrared Telescope facility on Mauna Kea, Hawaii, Sromovsky's team was able to observe the distant planet in a variety of wavelengths, each providing a different set of information about Neptune's clouds, their structure, and how they circulate.

By observing the planet's clouds and how they move, scientists can make more precise calculations of Neptune's wind speeds and directions.

In addition to Sromovsky, the team of scientists making the new set of observations includes Sanjay Limaye of the UW-Madison Space Science and Engineering Center; Kevin Baines and Glenn Orton of the Jet Propulsion Laboratory in Pasadena, Calif.; and Andrew Ingersoll of the California Institute of Technology.

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— Terry Devitt, (608) 262-8282, trdevitt@facstaff.wisc.edu

Space Science + Engineering Center

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NEWS

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FOR IMMEDIATE RELEASE 6/5/96

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PUBLIC LECTURES TO SPAN THE COSMOS

MADISON — This month, University of Wisconsin-Madison's Space Science and Engineering Center will sponsor four public lectures that promise an inside look at some of the hottest topics in astronomy.

Between June 9 and 13, five experts will speak on their astronomical experiences in Room 1100 Grainger Hall, 975 University Ave. Each lecture will begin at 7 p.m. and is free and open to the public.

• On June 9, author William Sheehan and UW-Madison planetary scientist Sanjay Limaye will recount observations of Comet Shoemaker-Levy's spectacular impact on Jupiter.

• On June 10, David Black, director of the Lunar and Planetary Institute, will discuss the search for other planets in the universe.

• On June 12, John Briggs of the University of Chicago's Yerkes Observatory, will describe his astronomical experiences at the South Pole.

• On June 13, John Trauger of the Jet Propulsion Laboratory will describe the latest Hubble Space Telescope discoveries.

The lecture series is made possible by NASA's Initiative to Develop Education through Astronomy or IDEA program.

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— Terry Devitt, (608) 262-8282

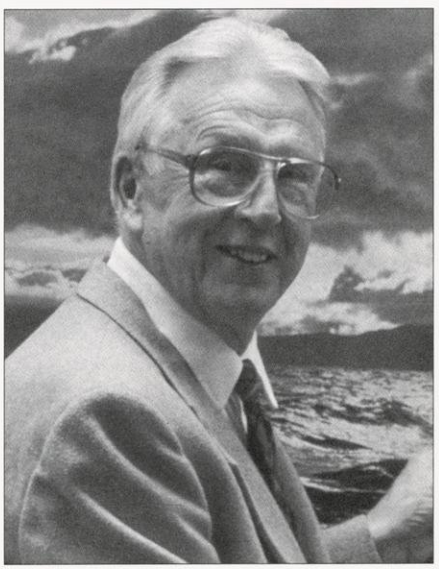
SSEC

Space Science and Engineering Center

University of Wisconsin–Madison

Jay Salvo, Photographic Media Center, UW-Extension

The Atmospheric, Oceanic and Space Sciences Building is a landmark on the University of Wisconsin–Madison's south campus.



Michael Kienitz, form. UW-Madison News & Public Affairs

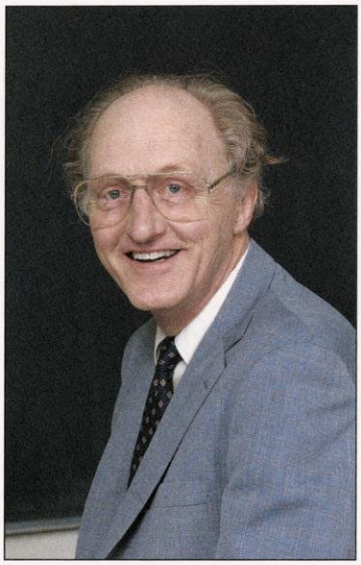
Verner E. Suomi
1915–1995

- In Memoriam -

Contents

Message from the Director

The University of Wisconsin is the principal focus within the state for higher education—a world class center of learning, a leading contributor to the advancement of knowledge, and a resource of inestimable value to the citizens of Wisconsin. As an integral part of the University, the Space Science and Engineering Center is concerned mainly with scientific research and technology development that enhances understanding of the atmosphere of Earth and other planets, building on the opportunities and challenges associated with the perspective from outer space.



Jay Salvo

Professor Francis P. Bretherton

Our constituency is humankind, sometimes exploring the universe from space-based telescopes, sometimes helping probe other planets in our solar system, but more often looking down to gain information and insights into weather, climate, and other aspects of our global environment. We seek always to pass on that knowledge to others in a manner that is useful to them. We distribute data and develop software for use by researchers and operational meteorologists all over the world. Collaborating with faculty from several departments on the Madison campus and elsewhere, we provide a unique environment for students to learn how to use state-of-the-art technology in cutting edge research. We assist high school and middle school teachers to meet their needs for exciting current information.

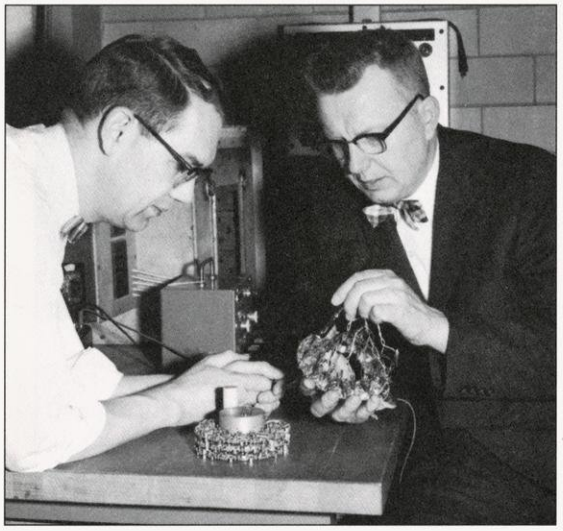
This booklet provides only a sample of the many projects underway. Our team is a strong one, and we are proud of what we do!

—Francis Bretherton

Contacts: Robert J. Fox, Executive Director, 1225 W. Dayton St., Madison, WI 53706, bob.fox@ssec.wisc.edu
Terri Gregory, Public Information Specialist, terri.gregory@ssec.wisc.edu, 608-263-3373

Space Science and Engineering Center

In the late 1950s, two pioneers in their respective fields of meteorology and electrical engineering gathered around them a group of talented scientists and engineers to create the first instruments that measured the earth's atmosphere from space. The innovative efforts of Professors Verner E. Suomi and Robert J. Parent led to the establishment in 1965 of the Space Science and Engineering Center in the University of Wisconsin–Madison's Graduate School. With Suomi as the first director, SSEC quickly established a reputation as a multidisciplinary research and development center serving principal investigators from other university departments and its own researchers with state-of-the-art facilities.



University archives

Professors Robert Parent and Verner Suomi fabricate early weather experiments to fly on the first American satellites.

The research interests of SSEC's scientists and outside investigators fall into three major classes:

- the atmospheres of earth and other planets
- interactive computing, data access and visualization
- scientific instruments and spaceflight hardware

Under Director Francis Bretherton, SSEC also studies global climate change and offers its archive of weather satellite information to support climate studies. SSEC develops new scientific instruments that provide progressively better views of the Earth. Its scientists and programmers write computer software that makes earth science and planetary data more accessible and useful. SSEC continues to build instruments to measure the atmospheres of other planets; those extraterrestrial laboratories provide new insights into the workings of Earth's own weather.

Ron Koch

SSEC's antennas: The dish in the foreground brings in Meteosat and other weather data. Those on the building are trained on U.S. geostationary satellites.

An SSEC Profile

- Staffing: 180 permanent, 25 graduate student and 30 undergraduate student hourly employees
- Annual revenues: $11–12 million
- 1995 funding: NASA 27%; NOAA 21%; NSF 11%; DOE 11%; and a mix of federal, private and international sources, 30%
- Staff composition by highest degree: 17% doctoral, 32% master's, 45% bachelor's and 6% high school
- Staff composition by work discipline: 41% science, 23% computing, 15% engineering and 21% general and administrative
- An R&D center: Not an academic (degree granting) department
- Program breadth: About 85 significant programs/contracts/grants active at a time
- Long-term foreign visitors: Average 3–5 in residence
- Floorspace: 40,000 square feet in the Atmospheric, Oceanic and Space Sciences Building
- Computational facilities: 356 computers including mainframe, with more than 300 networked

University archives

High Speed Photometer was fabricated in SSEC's machine shop supervised by Robert Sutton.

University archives

Gene Buchholtz assembles a detector controller for the Diffuse X-ray Spectrometer experiment.

Rick Kohrs

The morning's fog through the Ohio River valley and eastward was spectacular. This image from the NOAA-12 satellite was created by McIDAS using several channels from a single high-resolution instrument.

Facilities

SSEC provides the gamut of facilities a principal investigator expects from a well-equipped research and development center, including a machine shop, electronics assembly areas, clean room, and temperature and vacuum chambers. Other center resources are noted below.

Meteorological Data Archives—Weather satellites are vital to climate study and weather forecasting. They provide the only available information for inaccessible areas of the Earth, particularly the oceans. Supporting the World Weather Experiment, SSEC became the archive for U.S. geostationary weather satellite data in 1978. The archive now contains more than 186 terabytes (33,500 videotapes) of digital data. Through a contract with the National Oceanic and Atmospheric Administration (NOAA), this data is made available to scientists around the world.

SSEC also houses the Antarctic Meteorological Research Center, providing satellite and other information for researchers working at the South Pole.

Data Acquisition—Three rooftop dish antennas receive U.S. geostationary satellite data; a large ground-based dish receives Meteosat data (geostationary over Europe and Africa) and stored NOAA polar orbiting data; and a tracking antenna receives real-time, line-of-sight data streams transmitted by NOAA polar orbiting satellites. Numerous dedicated line and Internet sources also provide nonsatellite atmospheric data.

Computer Support—SSEC supports its research mission with customized computing facilities. The computing environment combines IBM (mainframe and PC), Apple Macintosh, and Unix operating systems.

The Schwerdtfeger Library—This scientific library supports research and development efforts of SSEC and NOAA scientists and their affiliates, and provides instructional support to atmospheric and oceanic science faculty and students. The library collects books and data in the space and atmospheric sciences. Special collections include scholarly papers; films; videotapes; government, university and international documents; satellite photographs dating to 1966; and digital data. Special emphasis is placed on background research and materials for ongoing and newly funded projects. Reference services include access to campus-wide networked databases and other on-line resources.

Affiliations

National Oceanic and Atmospheric Administration—NOAA researchers are stationed at SSEC in the Cooperative Institute for Meteorological Satellite Studies. The NOAA group emphasizes remote sounding of the atmosphere with temperature and moisture profiles and winds derived from cloud tracers. These and other satellite data products are integrated into severe weather studies and weather forecasting applications.

Department of Atmospheric and Oceanic Sciences—Sharing the same building facilitates joint research programs with SSEC, including support for the research activities of graduate students. Some SSEC scientists also teach in this department. Of note are efforts to use three-dimensional and McIDAS data interactively in undergraduate classes.

Other UW–Madison departments—Principal investigators from the Departments of Physics, Astronomy, Computer Science, Soil Science, and the College of Engineering collaborate with SSEC scientists and use SSEC facilities.

Outreach

Although SSEC is not a teaching department, it is committed to making satellite information and the fruits of its research accessible over the Internet, through the Cooperative Institute for Meteorological Satellite Studies, and through federally funded outreach projects such as work with middle schools.

SSEC supplies up-to-date satellite imagery, both through the Gopher and World Wide Web. SSEC also exploits the educational possibilities of the Internet to distribute examples of our research and scientific software. Access SSEC information at the following Internet addresses:

- http://www.ssec.wisc.edu
- http://www.ssec.wisc.edu/data/index.html
- http://cimss.ssec.wisc.edu
- http://uwamrc.ssec.wisc.edu/
- gopher://gopher.ssec.wisc.edu

This booklet presents examples of SSEC research. Only a few of SSEC's many projects are presented in depth. SSEC welcomes your questions about its work.

Milestones

1957 Group formed to measure Earth's energy from space
1959 Explorer VII gives volumes of useful new data on global radiation budget
1965 Space Science and Engineering Center founded; V.E. Suomi first director
1966 Suomi spin-scan camera launched on first geostationary weather satellite
1969 Work with NASA's Jet Propulsion Laboratory (JPL) begins with Mariner
1970 Pre-McIDAS software developed for fast, accurate atmospheric motions
1971 Verner Suomi named to JPL's Imaging Team for Voyager planetary flybys
1974 SSEC is first nongovernment ground station for geostationary satellite data
1975 Low-energy x-ray experiment flies on orbiting solar observatory
1977 NOAA scientists arrive at SSEC for joint satellite meteorology research
1978 Pioneer Venus Net Flux Radiometer measures Venus heat fluxes
1978 SSEC designated national archive for GOES data
1978 Concept for interferometric high vertical resolution remote sensing developed
1979 McIDAS hardware and software used by agencies in U.S. and abroad
1970 CIMSS develops numerical model with Australian meteorologists
1980 Atmospheric sounder first time on geostationary satellite
1986 Concept for interferometric sounder proven from aircraft
1989 32 organizations worldwide have systems based on McIDAS
1990 Hubble Space Telescope launched with High Speed Photometer on board
1993 DXS flies on Space Shuttle for first evidence of hot plasma
1993 Model developed to simulate hydrological cycle
1994 New GOES technology operational with SSEC support
1994 EPA uses scientific visualization to view air pollutants in five dimensions
1994 Internet becomes SSEC's major weather satellite data carrier
1994 WIYN Telescope control system enables remote observing
1995 Galileo Probe sends net flux measurements from Jupiter

John Mecikalski

Lake Superior rarely freezes completely, but did in 1994. The NOAA-11 polar-orbiting satellite captured the event on February 9.

Context

SSEC's atmospheric scientists participate in projects ranging from international studies and field experiments in the development of weather observing tools for our nation's weather service to individual research conceived and executed entirely in-house. SSEC remains a mecca for satellite meteorologists and contributes to next generation technology for geostationary satellites through software development and simulations. The Cooperative Institute for Meteorological Satellite Studies, with a contingent of NOAA employees, works toward extending the range and quality of weather forecasts and developing a better understanding of our complex atmosphere and its interactions. Also see their Web site: **http://cimss.ssec.wisc.edu**

Scientists also study Earth's and other planets' energy balance, processes of momentum exchange, and critical weather events in various scales of atmospheric motion to improve basic understanding and prediction.

Lee Buescher, Watertown High School

Matt Engelbrecht at Watertown High School enriches his science classes with McIDAS help.

Cooperative Weather Research

The Cooperative Institute for Meteorological Satellite Studies (CIMSS) is a world class leader in the development and applications of weather remote sensing systems. Created in 1980, CIMSS is a federally-sponsored university institute established by the NOAA and the UW–Madison. At the Space Science and Engineering Center, CIMSS scientists develop many weather observation tools: They design and test new remote sensing instruments that will improve satellite, aircraft, ship and land-based measurements of the Earth's surface and atmosphere; they develop physical/mathematical models for transforming remote sensing data into geophysical variables such as temperature, humidity and wind; they develop and implement techniques for using satellite observations to improve forecasts of severe storms; and they use satellite data to study climate and global change.

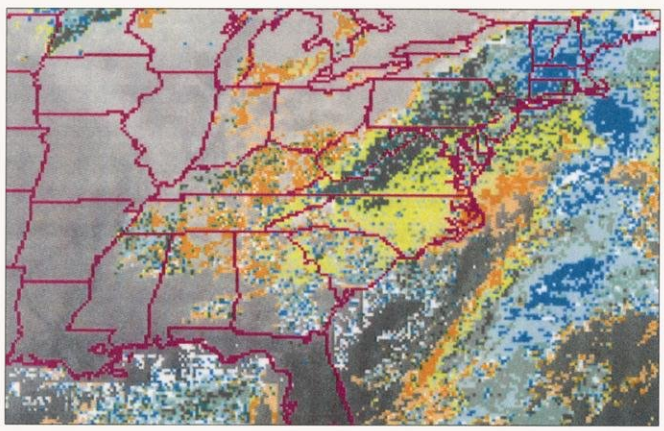
Locally, CIMSS helped create the Wisconsin Space Grant Consortium. This NASA-sponsored organization brings together Wisconsin scientists, teachers and students who share common interests in science, engineering and related technology. Through this organization, CIMSS developed the Summer Workshop in Earth and Atmospheric Sciences, which has been held since 1991 at UW-Madison. The workshop gives Wisconsin high school students and physical science teachers hands-on technology learning about atmospheric science, earth science, satellite meteorology and planetary meteorology. An associated Satellite Technology Education Program brings SSEC's interactive computer system to state high schools. Using Internet and McIDAS installed at High Schools, students and teachers are provided with current satellite images and other important weather information. Teaching modules provide students with independent technology for hands-on instruction using newly-developed curriculums which incorporate the system into science classrooms.

Globally, CIMSS provides scientific leadership in the processing and use of temperature and moisture measurements from the sounding instrument TOVS (Tiros-N Operational Vertical Sounder), which is located on NOAA's polar-orbiting weather satellites. CIMSS developed a series of software modules, called the International TOVS Processing Package, which takes the sounding measurements and converts them into useful products. Meteorologists and scientists use these products to monitor hurricanes and other severe storms to produce more accurate weather analyses and forecasts, and to study changes in Earth's climate. CIMSS has licensed this software and distributes it internationally.

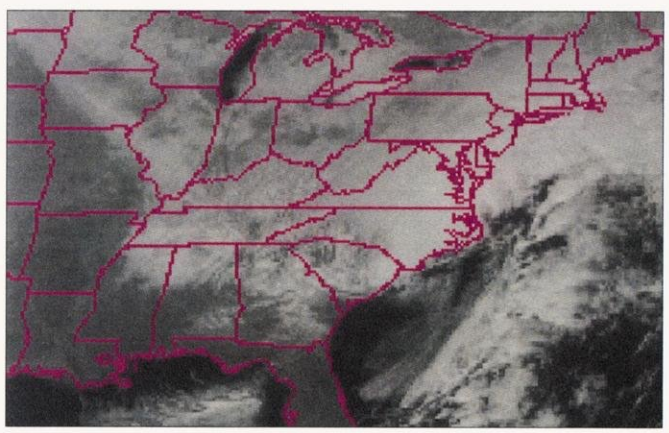
CIMSS is a center for international scientific collaboration in the development of improved computer procedures

(algorithms) for analyzing satellite data and producing more accurate weather predictions. This collaboration is achieved through a vibrant visiting scientist program. The international character of CIMSS began through collaboration with Australia, which is surrounded by ocean, with few conventional atmospheric measurements (surface and weather balloon). They helped pioneer the use of satellite soundings for computer modeled weather predictions. In exchange for CIMSS satellite sounding retrieval technology, the Australian weather forecast model was provided to the CIMSS which evolved, through the joint efforts of Australian and CIMSS scientists, into the CIMSS Regional Assimilation System (CRAS). The CRAS is used today for exploring the best methods of using satellite data in the weather analysis/forecast operation. CIMSS hosts scientists from nations all over the world for the purpose of improving weather forecast capabilities around the globe.

—William Smith & Thomas Achtor



Anthony Schreiner



Anthony Schreiner

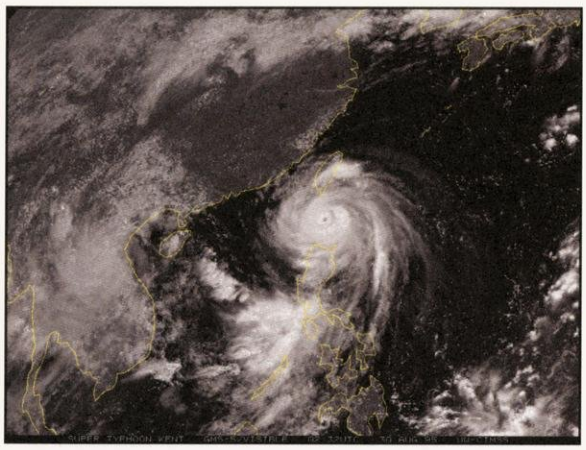
In 1994 the first GOES-Next satellite was launched. Long before launch, CIMSS researchers derived a suite of products from GOES imaging and sounding instruments to be ready upon launch. Refinement of these Day-1 products and development of other innovative satellite-derived products, called Day-2 products, will continue throughout this GOES series. This example of a GOES derived product shows pressure at cloud top using GOES-8 measurements (top). The National Weather Service uses a product like this to augment cloud information above 12,000 feet. A visible image is on the bottom.

GOES-Next Is Now

SSEC's CIMSS and McIDAS groups are major contributors to the U.S. Geostationary Operational Environmental Satellite (GOES)-Next program, technology enabling a new satellite series to take far more observations with higher accuracy than previously possible. SSEC's work is a key element in the National Weather Services' program to modernize weather analysis and forecasting. CIMSS research includes gathering long-term environmental data to assess changes in the environment.

SSEC worked with GOES-Next contractors and NOAA during prelaunch construction and testing, and in postlaunch evaluation of instrument performance. The McIDAS team provided essential software to bring in the new data types sent from the new satellite. CIMSS scientists assisted in instrument calibration and developed applications for the new data. They continue to work with NOAA in product development and testing, training, research and development of new products, and planning for instruments on GOES-R (the next generation U.S. geostationary weather satellite).

Key products created at CIMSS for the GOES program include atmospheric motion vectors; atmospheric temperature and moisture profiles; total column water vapor and total column ozone; sea and land surface temperature and albedo; cloud coverage, height and emissivity; and precipitation coverage. These products directly affect NOAA forecasting, including local severe storm warnings, winter storm forecasts, and large scale hurricane intensity and trajectories.

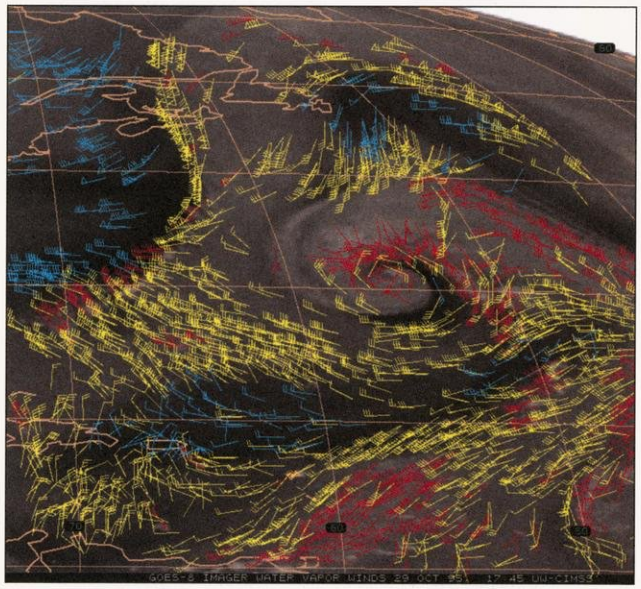


This enhanced visible image shows Super Typhoon Kent on August 30, 1995. Winds were estimated at 130 kts (150 mph), gusting to 160 kts (184 mph). The image was provided by Japan's Geosynchronous Meteorological Satellite, GMS-5.

Tracking Tropical Cyclones from Wisconsin

CIMSS scientists are developing new methods of analyzing satellite data to improve storm prediction. The Naval Research Laboratory and the National Oceanic and Atmospheric Administration (NOAA) sponsor this research. The Navy finds typhoon information critical because it must protect its resources and bases in the western Pacific Ocean. NOAA needs hurricane information for its Tropical Prediction Center (TPC) in Miami, Florida. Hurricanes and typhoons are regional names for tropical cyclones.

Christopher Velden and his colleagues in the tropical cyclone group optimize methods for analyzing satellite data and making it available to the TPC and the Joint Typhoon Warning Center in Guam. While TPC uses satellite images to track storm paths visually, CIMSS uses McIDAS to extract quantitative information from the images, such as wind vectors. The environmental wind field, or the large-scale flow in which the cyclone exists, steers the storm and is the most important feature in cyclone movement. Satellites, able to see large areas at once, are the main source of wind field data over open oceans.



This GOES-8 water vapor image shows Hurricane Tanya on October 29, 1995. Wind barbs are experimental high-density wind measurements derived from the motion of water vapor at different levels in the atmosphere—red, 150–250 mb; yellow, 251–350 mb; blue, 351–500 mb. These wind measurements are being modified for use specifically in tropical cyclone research.

The pictures on this page were produced by Christopher Velden and Timothy Olander.

Like the Tropical Prediction Center, the CIMSS group tracks the storms using visible and infrared satellite images, but it also uses water vapor images. Unlike visible and infrared images, which only show moisture concentrations in the form of clouds, the water vapor images display water vapor in cloudless air as well. This is particularly useful for detecting air flow *between* cloud regions. Hurricane Erin (1995) makes a good case for using these images. Using traditional methods to predict the storm movement, Erin should have hit Miami. However, the water vapor imagery revealed features in the air flow, not apparent from other data sources, that jogged Erin north 200 miles.

Tropical cyclone intensities and paths remain difficult to determine, leading to warnings covering hundreds of miles along the coast. Because this creates a "cry wolf" syndrome, people may not respond to the warnings, which can ultimately be disastrous. CIMSS feels that satellite derived products will increase the accuracy of forecast models, making forecasts more precise and warnings more effective.

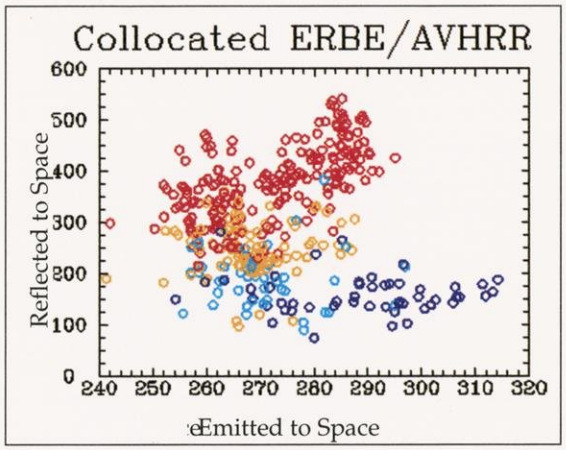
—*Susan Sowinski and Christopher Velden*

Balancing the Budget

NASA's Earth Radiation Budget Experiment is a system of satellites that observe Earth's energy balance. Each ERBE satellite measures how much solar energy the Earth absorbs and how much energy it emits. SSEC scientists serve on the science team which guides NASA on the status of ERBE instruments and on data analysis. Observations from ERBE have improved our understanding of how clouds influence the energy balance of our planet.

Any object, including the Earth, will warm or cool depending on its energy imbalances. If the object receives more energy than it loses, the object will warm. If the object loses more energy than it receives it will cool, and if the energy gains equal the energy losses, the temperature does not change.

The only way the Earth can exchange energy with its environment (the solar system) is through radiation. ERBE measures the radiation balance between space and Earth. Just because a given region of Earth is receiving more radiative energy than it is losing to space does not mean the region's temperature is increasing. The atmosphere and ocean can move this excess energy to a different region of the globe, perhaps one that is losing more energy than it is receiving. Atmospheric modeling and climate studies depend on knowing Earth's radiation balance.

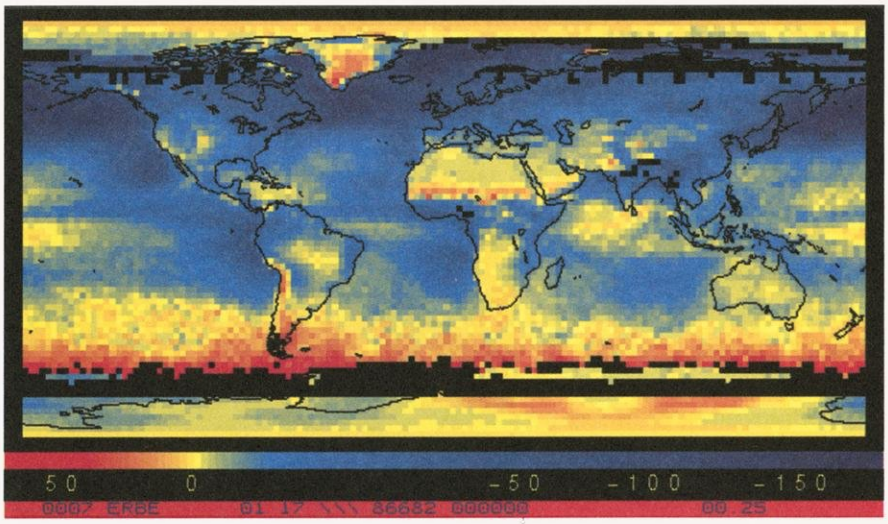


Steven Ackerman

SSEC scientists study the impact of clouds by collocating ERBE measurements with other satellite instruments. Here a high-resolution instrument defines how much low level cloud is in the ERBE scene (blue—clear; cyan—partly cloudy; gold—mostly cloudy; red—overcast). Each point represents an ERBE measurement. The clouds have a greater impact on the solar energy balance than on the energy emitted to space.

The ERBE program studies how clouds affect the radiative energy balance of the planet, and thereby influence climate change. Clouds generally reduce the radiation emitted to space and thus tend to warm the planet. Also, clouds reduce the absorbed solar radiation, due to a generally higher albedo (or brightness) than the underlying surface, and thus tend to cool the planet. The latest results from ERBE indicate that, on average globally, current cloud conditions reduce Earth's radiative energy gains.

—Steven Ackerman



Christopher Collimore & Richard Frey

The picture depicts the net effect of clouds on Earth's radiation balance during July averaged for the years 1985–1988. Off the coast of California, a region where stratus clouds predominate, the clouds result in a cooling of the Earth. In the tropical regions, where thunderstorms are common, the effects of the clouds on the solar and terrestrial radiation balance tend to offset one another, so the net effect is near zero.

Liam Gumley

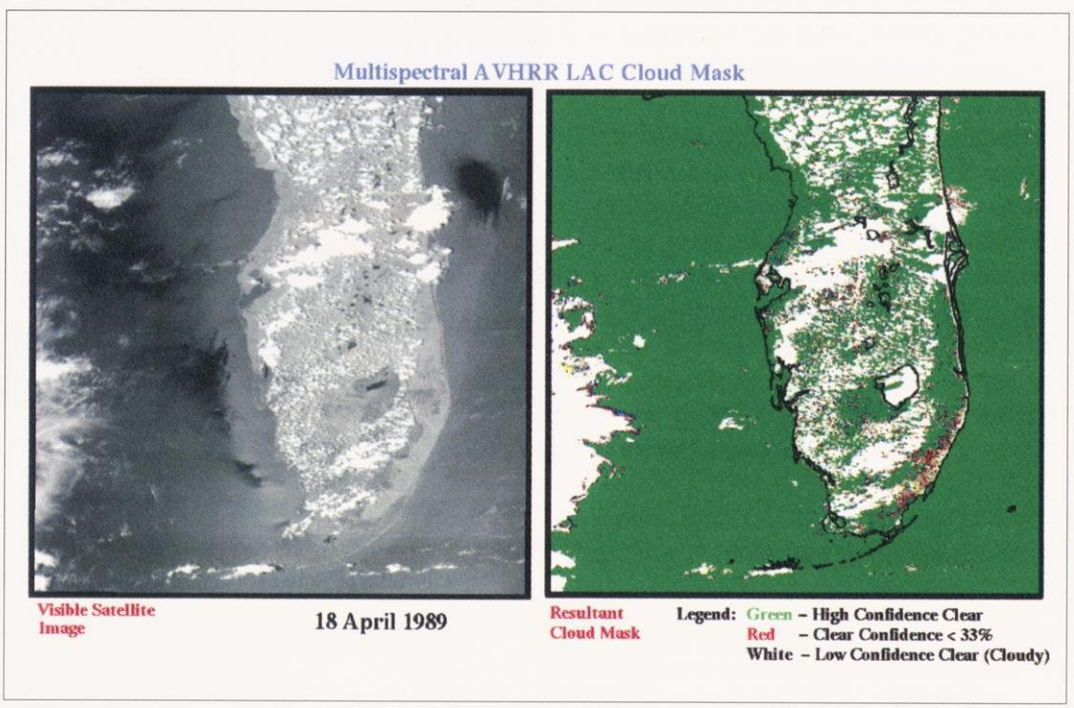
The image above was acquired by the MODIS Airborne Simulator and shows high-level cirrus clouds (purple and white) over a low-level stratus deck over the Gulf of Mexico. The cirrus cloud at the lower right casts its shadow (dark purple, lower left) on the stratus deck.

Studying Earth's Cloud Cover

Researchers at the Cooperative Institute for Meteorological Satellite Studies are developing software for a new satellite instrument that monitors cloud cover and cloud top properties. Planned to launch in June 1998, the Moderate Resolution Imaging Spectroradiometer (MODIS) will routinely generate global science products including cloud cover and cloud top properties. Monthly, yearly and seasonal statistics will be produced from the daily products and global cloud characteristics can be examined for trends.

MODIS is the key instrument on the satellites that will eventually make up the Earth Observing System. Thirty-six high-resolution channels on the MODIS will allow investigators to study clouds in unprecedented detail, building on products generated from other instruments and extending climate datasets.

By testing portions of the MODIS computer procedure, or algorithm, on Advanced Very High Resolution Radiometer data, researchers produced the cloud/no-cloud product called a cloud mask. The MODIS cloud mask uses threshold tests to determine how clear or cloudy an image is. Each scene, or point on the image, is given a clear confidence level. While building on previous cloud clearing algorithms, MODIS improves them because the instrument has more spectral channels and higher resolution.



Kathleen Strabala

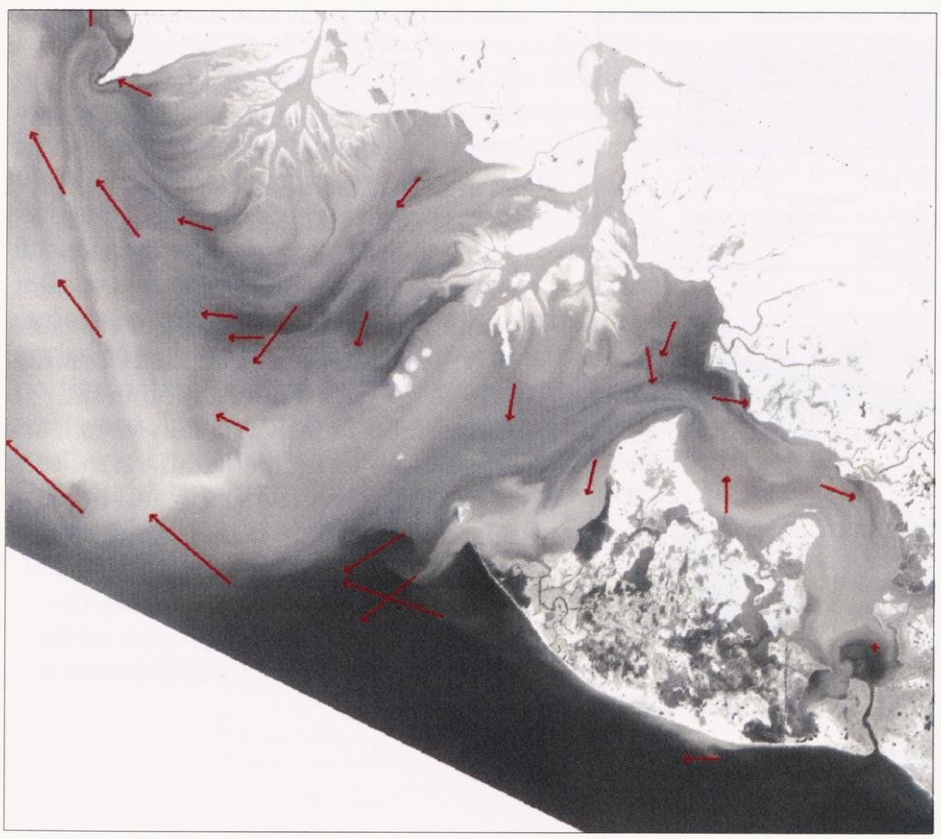
A cloud mask, such as that at right, provides the probability that a field of view is unobstructed by cloud.

Along with their usefulness in monitoring global cloud cover statistics, cloud masks will also signal when other MODIS products should be applied. For instance, land and ocean investigators will only use observations identified as very high confidence clear, whereas the cloud-top property product will only be generated in cloudy regions.

Cloud-top property products will be used to determine the type and trends of clouds around the world. This information is important because different cloud types can react differently to solar and planetary radiation. For instance, cirrus clouds (thin wispy horsetails) allow incoming solar radiation to pass through, but absorb outgoing planetary radiation. Cumulonimbus clouds (thunderheads) strongly reflect solar radiation and absorb planetary radiation.

This CIMSS research effort is part of NASA's Mission to Planet Earth. The project is dedicated to understanding the changing Earth system and communicating with world governments so that policy decisions affecting the future are based on accurate scientific information. Precise monitoring and understanding of clouds and their role in the Earth system will be a crucial part of this process.

—Kathleen Strabala



Christopher Moeller

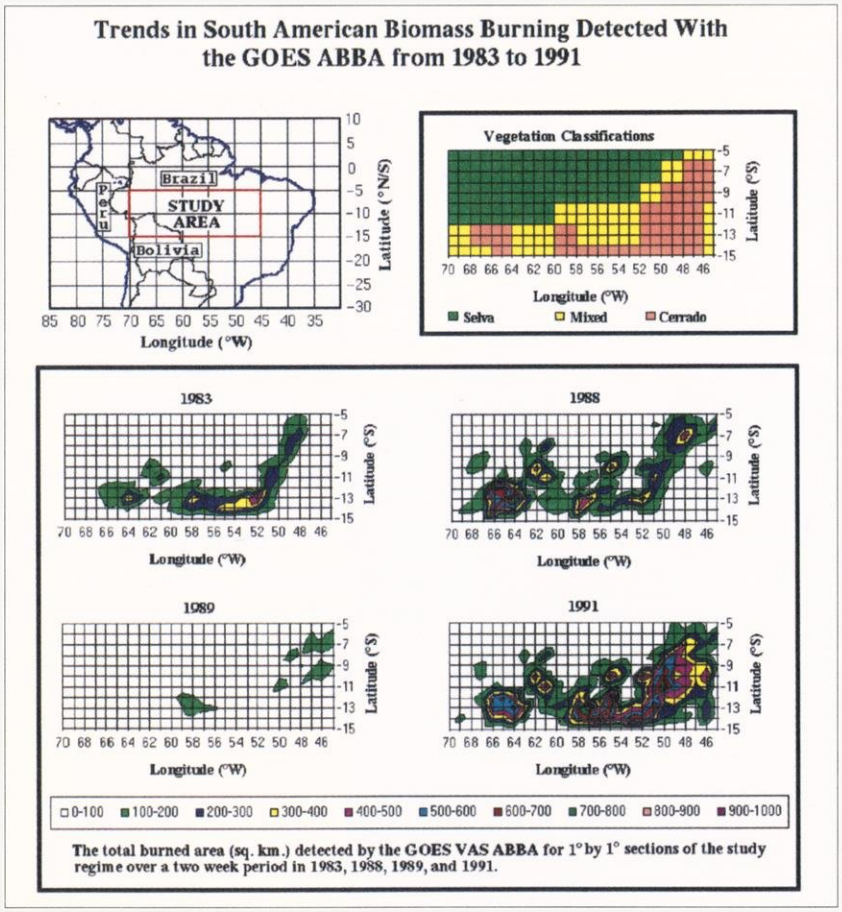
NASA's aircraft-mounted MODIS Airborne Simulator (MAS) explores coastal water circulation. This MAS 50-meter resolution visible image from January 24, 1995 shows coastal circulation in 50 kilometers of the Atchafalaya Bay region of the Louisiana coast. Red arrows represent water motions of 10 to 50 centimeters per second (proportionate to length of vector). Here, a myriad of water types (turbid river, fresh marsh, estuarine, saline) come together to support a fragile marine ecosystem that persists by maintaining specialized environments associated with these water types.

Monitoring Fires by Satellite

The burning of forests and grasslands around the world raises concerns about the effects on ecology and climate. The extent of biomass burning has become increasingly evident as satellites allow monitoring of global burning from space. In South America, burning is associated with deforestation in the selva (forest) and agricultural burning in the cerrado (grassland). CIMSS scientists are working to identify the extent and patterns of burning in South America using satellite data to monitor active fires and smoke transport.

With funds from NASA, scientists use data from U.S. geostationary satellites to identify and track both smoke and fires in South America. SSEC's archive of geostationary weather satellite data allows researchers to survey biomass burning and quantitatively assess the trends. They combine visible and multispectral infrared data from the U.S. Geostationary Operational Environmental Satellite (GOES) to distinguish smoke from other clouds and to track the movement of smoke and aerosols. To identify active fires in satellite imagery, CIMSS scientists have developed a computer procedure, or algorithm. The Automated Biomass Burning Algorithm (ABBA) uses GOES infrared data to identify fires and estimate their size and temperature.

To measure trends in the level of burning in South America during the 1980s, researchers applied the ABBA to an area that included parts of Brazil, Bolivia and Peru (see graphs on this page). Data was analyzed from two weeks at the peak of South America's burning season for 1983, 1988, 1989 and 1991. The study area included burning associated with deforestation in the Amazon Basin (selva or rain forest), and grassland management and agricultural applications in the cerrado and in the mixed regions (top right graph). The graphs at the bottom show the burned area in 1° square sections during the entire two-week period in each of the four years studied. The 1989 burning



Elaine Prins

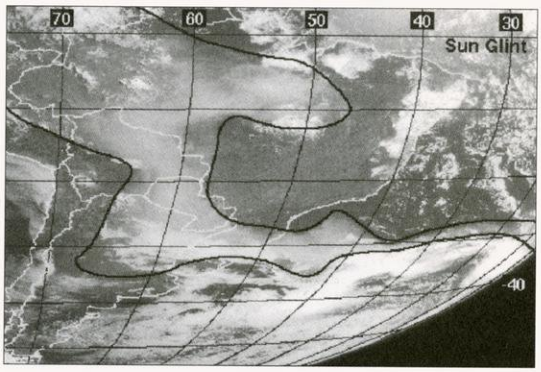
This graphical representation shows trends in biomass burning in parts of South America. Colors indicate how much, in square kilometers, of the area was burned.

season was abnormally wet, and the study region was covered by clouds hindering both burning and monitoring efforts. Twice as much average daily burning was detected during the two weeks in 1991 as in 1983; fire activity nearly doubled in the selva and mixed regions and tripled in the cerrado. Although these are only estimates of the amount of fire activity in the study area, they show how the area affected by burning has increased. In 1991, fires in the selva spread to a region three times larger than in 1983. The area containing evidence of fire activity was roughly 85,000 square kilometers in 1983 and increased to 285,000 square kilometers in 1991. During the early and mid 1980s the amount of burning in the selva regions of Brazil increased rapidly but leveled off from 1988 to 1991, while fire activity in the cerrado and mixed regions continued to increase.

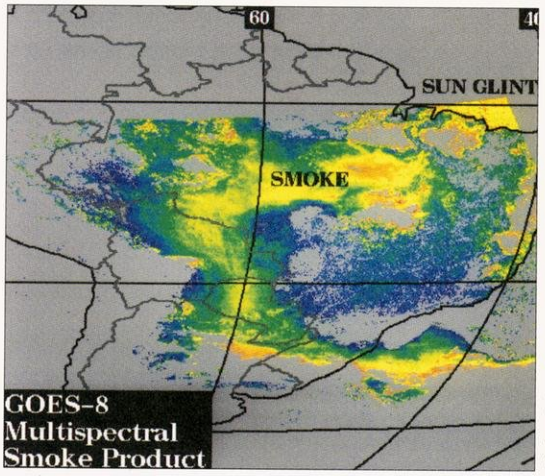
The 1994 launch of GOES-8, the first in a series of new GOES satellites, introduced a new capability for monitoring fires in the Western Hemisphere. For the first time it is possible to monitor wildfires in North America every 15 minutes. The new satellite capabilities also allow scientists to detect smaller fires and provide more detailed results with the GOES-8 ABBA technique in South America. GOES-8 will monitor biomass burning trends in South America throughout the next decade.

During the 1995 biomass burning season, GOES-8 provided information on smoke transport and the location, size, and average temperature of fires. As in previous years, large smoke palls were seen in the GOES-8 visible imagery. The visible image (top, this page) shows South America and the Atlantic Ocean on the morning of August 28, 1995. The smoke is outlined with a heavy black line and covers more than six million square kilometers. It represents a combination of emissions during the previous week from deforestation and agricultural burning. The easterly winds in the northern portion of the Amazon Basin carry the smoke and aerosols westward. The Andes Mountains then act to deflect the smoke southward, where westerlies carry it over the Atlantic Ocean. The bottom composite image shows the automated CIMSS smoke product for the same day.

—Elaine Prins



Elaine Prins



Elaine Prins

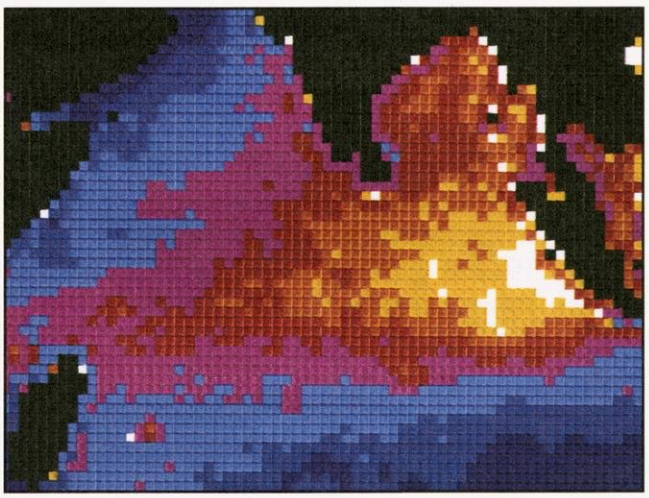
The bottom image shows an enhanced view of the smoke outlined in the top, visible image. Yellow and orange regions generally indicate areas of heavy smoke cover, green signifies moderate to light smoke, and blue represents minimal smoke and haze. This color enhanced image is based on an automated visible and multispectral infrared technique which distinguishes smoke from multilevel clouds and low-level moisture.

Estimating Rainfall

Rain challenges scientists because it is difficult to measure but too important to ignore. As much as any element of the atmosphere, rain defines weather and climate. Too much of it brings floods; too little of it brings droughts.

To capture more of its variability, over the last few decades meteorologists and hydrologists have devised new ways to measure rainfall. An optical rain gauge measures rainfall on the scale of city blocks; a radar, on the scale of counties or even a state. From space a satellite can observe the atmosphere—if not measure rainfall—on the scale of an ocean.

A few weather satellites measure radiation emitted by raindrops or the ice crystals that melt into raindrops. Most actually measure radiation emitted or reflected by the clouds that make the rain. But whether it measures radiation from rain or from cloud, simultaneously the satellite may receive radiation from the clear atmosphere, from land and from sea. To tease rainfall out of this mix of signals, the meteorologist independently measures signals from the atmosphere, the land and the ocean.



Barry Hinton

This map of Indian Ocean rainfall (1979–81) shows a pattern of bands over the area. One pair of bands straddles the equator (running from left to right through the center of the map). A second pair of bands parallels the east coasts of the Arabian Sea and the Bay of Bengal. Blue indicates 0–500 millimeters of rain per year; magenta and red, 500–1500 mm; orange and yellow, 1500–2500 mm; white, more than 3000 mm a year. Black areas are land. Rain was estimated with measurements from the Nimbus-7 satellite's microwave radiometer using a rain-weighted multichannel algorithm.

The first weather satellites measured radiation in visible and thermal infrared wavelengths. First generation techniques used temperature or brightness to distinguish between raining and nonraining clouds. Typically, the raining cloud is cold or bright. SSEC contributed several such techniques includ-ing a simple infrared technique for estimating tropical rainfall. Researchers are also adapting an existing process to classify the rate of rain, rather than cloud type, in visible and infrared images.

Newer satellites use microwave sensors to "see" through cloud particles to the snow and rain within a storm. Recently, scientists have tried to combine the strengths of microwave instruments in polar orbit and infrared instruments in geostationary orbit. The microwave instrument distinguishes between rain and clouds, but views a scene at long intervals; the infrared instrument views a scene often, but tends to confuse rain and clouds. The two methods are combined by calibrating an infrared instrument through periodic comparisons with the rain rate inferred from a microwave instrument. This approach produces more accurate estimates of rain rates. Scientists expect that these new techniques will lead to a better understanding of the hydrologic cycle, the exchange of water between land, sea and atmosphere.

—David W. Martin

Modeling Global Processes

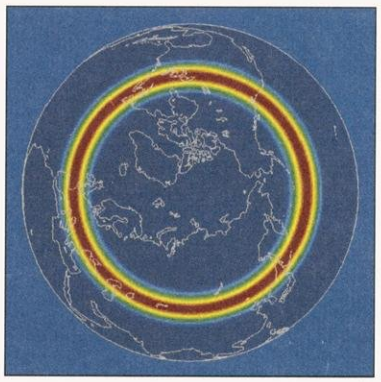
The atmosphere's circulation, its transport of water vapor and other substances, is a response to the solar energy that Earth receives. SSEC's Dynamic Modeling Group studies the atmosphere's hydrologic cycle and other transport processes occurring in monsoons and the westerly wind regime.

The group uses models and analysis of surface and space-based observations and other global datasets. Key to their efforts is a numerical model, called the UW global isentropic-sigma coordinate hybrid, that simulates climate. The model emphasizes hydrologic processes (movement of water in all its forms) and the exchange of ozone and other gases between the stratosphere and troposphere, the two layers of the atmosphere closest to the Earth.

Using the model, an idealized tracer substance can be followed as it moves throughout the atmosphere. The top picture portrays the initial state of this substance as a bright ring about the North Pole. Four days later, in the bottom picture, the model shows planetary transport of this substance within winter's westerly regime in the upper troposphere and lower stratosphere.

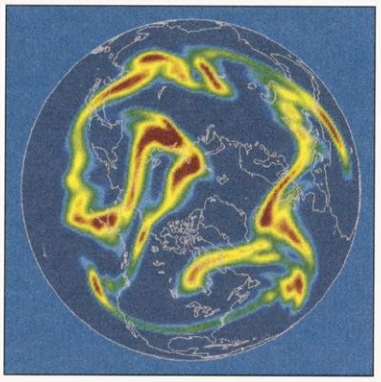
The model is uniquely capable in its ability to simulate hydrologic and transport processes.

—Professor Donald R. Johnson



SSEC's Dynamic Modeling Group

A trace substance encircles the pole in a numerical model's initial state.



SSEC's Dynamic Modeling Group

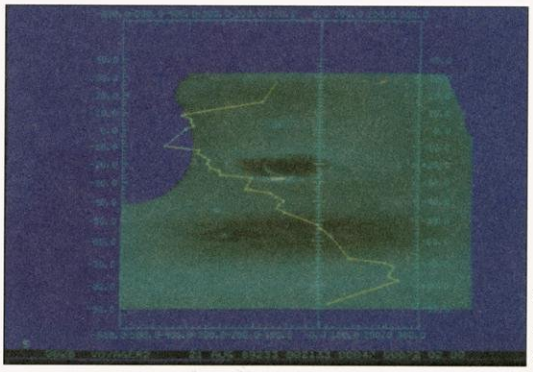
Four days later, the substance is distributed around the hemisphere.

Exploring the Planets from Earth

From cloud-shrouded Venus to gas giant Jupiter, SSEC planetary meteorologists have explored other worlds using data from space probes. Analysis at SSEC leads to important discoveries about the atmospheres of these extraterrestrial laboratories and gives insights into Earth's own atmosphere.

Delightful and amazing findings include the cloud bands of apparently featureless Uranus, the brightness asymmetry of Saturn's moon Titan, waves on Saturn, global circulation of Venus, Shoemaker-Levy Comet collisions on Jupiter, and Neptune's high winds. The Galileo mission's probe instrument, SSEC's Net Flux Radiometer, returned temperature and pressure information on Jupiter's atmosphere in 1995. SSEC scientists augment their studies of the planets and other planetary bodies like comets with the Hubble Space Telescope and ground-based telescopes such as that built by a consortium of Wisconsin, Indiana and Yale universities and the National Optical Astronomy Observatories.

—Sanjay Limaye



Sanjay Limaye

This image from Voyager II of Neptune was analyzed to find a profile of winds.

Context

SSEC pioneered the use of interactive computing for visualizing weather data. In 1970, SSEC prototyped the Man computer Interactive Data Access System (McIDAS) for showing and manipulating satellite images. The key to the ensuing popularity of this technology is interactivity, the ability of the scientist using the system to interact with the data, to manipulate it in any number of ways, and to do all that in real time. Based on a flexible software architecture, SSEC provides systems to organizations around the world.

SSEC has a background in three-dimensional visualization beginning with a form of red-green stereo used on McIDAS in the 1980s. Software has been developed to visualize large databases of earth science information, particularly the output from numerical weather models. SSEC provides much of this software free over the Internet.

McIDAS eXplorer gives space scientists access to data from solar system missions.

On these pages are some stories of McIDAS users. A separate McIDAS booklet is available for expanded coverage of McIDAS and more technical depth.

Real-world McIDAS

If you've ever heard a tornado warning, you've benefited from McIDAS. If you've ever watched the path of a hurricane over national TV, or held your breath watching a Space Shuttle launch, McIDAS has operated in the background. If you're a high school student in Watertown, Wisconsin, you may better understand physics and the weather through McIDAS demonstrations.

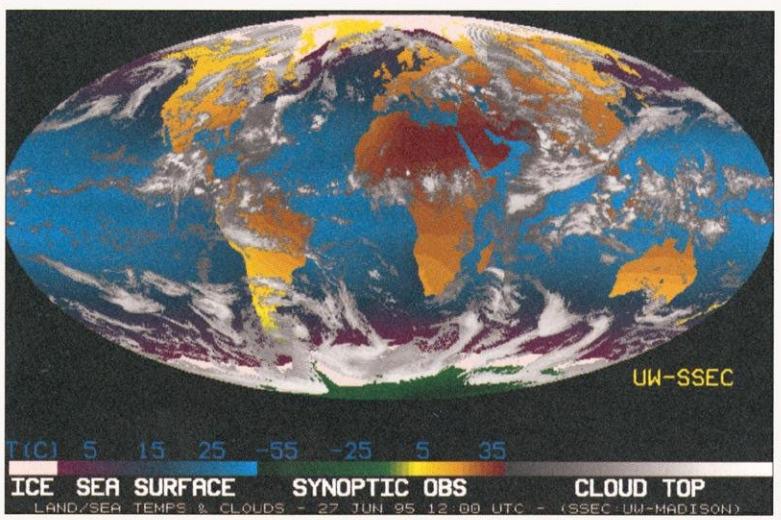
SSEC designs the Man computer Interactive Data Access System (McIDAS) used by the Storm Prediction Center in Norman, Oklahoma, to decide when to issue severe weather warnings. The Tropical Prediction Center in Miami, Florida, and U.S. weather forecasting centers for the space shuttle also use McIDAS to display and analyze satellite information.

From satellites in geostationary orbit 22,000 miles above the earth, signals are received in a McIDAS host computer and changed to a recognizable picture of the Earth. Adding weather information from around the world, a researcher using McIDAS can display and analyze weather patterns in real time.

Major weather forecasting agencies and Earth scientists around the world use McIDAS, but so do smaller agencies around the U.S., like North Dakota's Atmospheric Resource Board, who use their system to combat crop-damaging hail storms.

In Watertown high school, teachers Ron Graewin and Lee Buescher use technology like McIDAS to prepare youth for a technical world. Watertown, said Buescher, was the first high school in Wisconsin to introduce the new technology and to be planned around it from the wiring up. SSEC provided computers and McIDAS software; students have access to real-time images over the Internet. Chad Kreblin, in 1995 a freshman at UW–Madison majoring in meteorology, was a high-school junior when McIDAS was first introduced into the new Watertown High School. It fostered his emerging interest in meteorology. Watching weather patterns on McIDAS, Chad was awed "by the amount of power the Earth and atmosphere can generate." He wanted to know *why*. On McIDAS, said Kreblin, "I could teach myself about these things I was curious about."

—Terri Gregory



Rick Kohrs

This global montage was created by McIDAS from satellite, worldwide ground-based observation and sea surface temperature data. The Internet site gives more information: **http://www.ssec.wisc.edu/data/cmoll.html**

Forecasting the Rain in Spain

"McIDAS is the right tool for forecasting," said Jose Miguel Fernandez of Madrid, Spain's National Institute of Meteorology (INM). The Institute's tasks include weather observation and forecasting, climate studies, and meteorological support for environmental, agricultural and other public service applications.

Fernandez heads the satellite section of the Institute's remote sensing department where activities include maintaining an observational network (radar and lightning) and satellite data receiving stations. The section supplies INM's forecasters and research meteorologists with data and products from the European and U.S. geostationary and polar-orbiting satellites. INM rounds out its suite of forecasting tools with forecasting model outputs and many kinds of observations from the ground. The INM's version of McIDAS, called SAIDAS (Sistema de Adquisicion e Integracion de DAtos de Satelite) allows forecasters to use data in many different combinations.

In Madrid and at Spain's regional forecast centers, forecasters monitor the weather pulse of the nation. Throughout Spain, the media and other local and regional entities use INM forecasts to apprise the populace of dangerous weather. "Severe weather may occur everywhere in Spain, but occurs most often in the Mediterranean area." Fernandez explained that frequent small storms (50–100 km and even smaller) in this region are difficult to forecast. "We now have better knowledge of them, with help from McIDAS. And, while it's not our main focus, we try to study and perhaps forecast the occasional tornado. We have evidence of at least three in the last three years."

"McIDAS has many useful tools, including color enhancement, to analyze satellite images and to derive parameters of the atmosphere," said Fernandez. Meteorologists find McIDAS satellite sequences useful for studying which atmospheric conditions are most likely to favor thunderstorms and other weather phenomena, and to show how systems develop. "Before McIDAS," said Fernandez, "we just had indications of features now easily visible." On SAIDAS the meteorologists can integrate all the necessary and disparate data on one system, making weather forecasting more accurate.

—Terri Gregory

This GOES image was color-enhanced by McIDAS.

Rick Kohrs

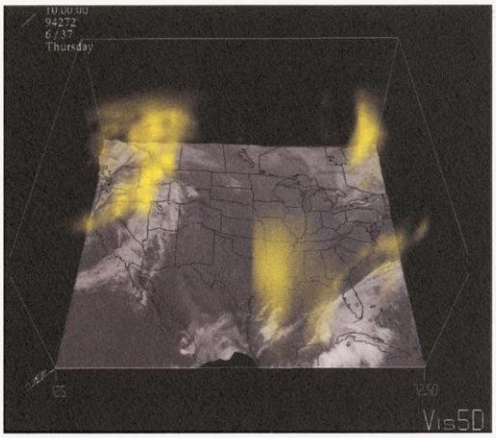
McIDAS On Display

Philadelphia's Franklin Institute Science Museum exhibits and explains science and technology. The Franklin Institute's Weather Center is designed to show visitors the operation of a modern weather station and give them a taste of the science of meteorology. More than one million visitors a year discuss current weather, meteorological principles and environmental issues with the staff meteorologist.

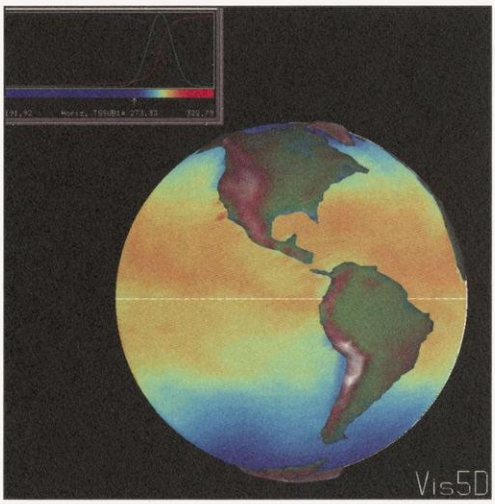
The Franklin Institute is the only museum using McIDAS. The Weather Center produces daily forecasts with its system, projecting the images so that visitors can watch the meteorologist produce each forecast. The display is an integral part of discussions given on the makeup of the atmosphere; it also helps explain the construction and use of weather charts and data, proving the adage that a picture is worth a thousand words.

The Science Museum is a place where science is demystified and visitors are challenged. The Weather Center wants its visitors to know that meteorology is a science, not a form of magic, providing a greater understanding of the atmosphere around us.

—Harold Vanasse,
The Franklin Institute, Philadelphia, PA



The clouds predicted by the CIMSS Regional Assimilation System (CRAS) appear yellow. The actual clouds observed by the GOES satellite are shown in white.



The warmer ocean waters are shown in red; the cooler regions are blue.

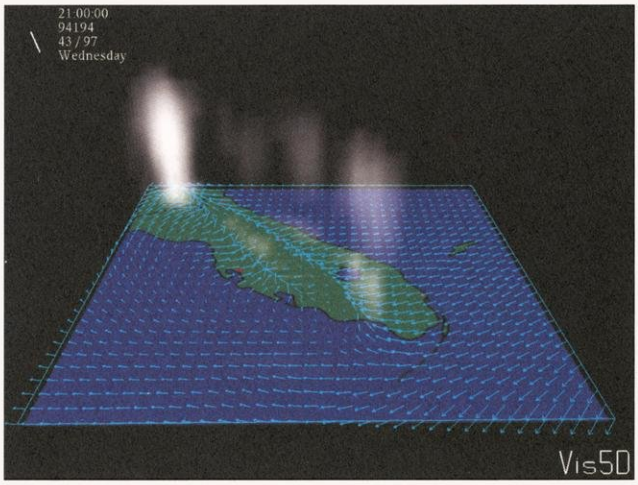
All images on these pages were produced by William Hibbard and Brian Paul using Vis5D and VisAD software.

Turning Numbers into Pictures

One of the biggest problems that Earth scientists face is making sense out of huge amounts of data. Researchers at SSEC have developed two visualization software programs, Vis5D and VisAD, that help scientists view and interact with their data in three dimensions. The programs help scientists understand very large datasets, containing billions of numbers, by turning numbers into pictures.

Scientists observe nature, formulate theories to fit their observations, and test those theories by using them to predict other observations. Computers help scientists make predictions by performing the numerous calculations required by simulation models. The Vis5D system was designed to let scientists understand the huge quantities of numbers generated by simulations of the Earth's atmosphere and oceans. The picture to the left (top) illustrates how Vis5D is used to compare simulations with observations. Vis5D is also used to look at ocean simulations. The bottom left picture shows how Vis5D can be used to examine global sea-surface temperatures produced by a coupled ocean-atmosphere model, which simulates the oceans and the atmosphere, and their interactions.

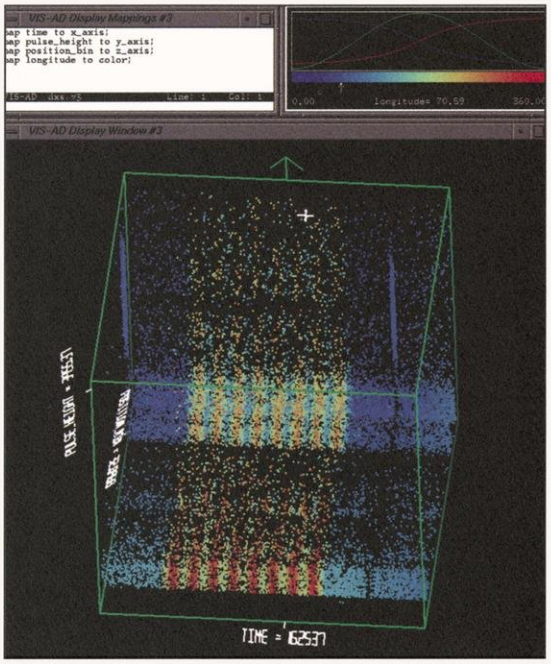
Dynamic processes are difficult to analyze without visualization. With Vis5D, scientists have a three-dimensional window to look through and test ideas. Researchers have used Vis5D to analyze the dynamic processes of Florida's afternoon thunderstorms. In the bottom picture, the wind arrows show colliding east and west sea breezes over Florida. When the breezes collide, the air has nowhere to go but up, which triggers the thunderstorms depicted by the vertical cloud columns.



In this picture, the wind arrows show how colliding sea breezes over Florida force the air up into thunderstorms.

Researchers also use Vis5D to understand air pollution. The picture at the bottom on this page is a three-dimensional image of acid rain formation. The yellow surface shows concentrations of a nitrous oxide produced by human activity, and the white cloud shows nitric acid produced when nitrous oxides react with moisture.

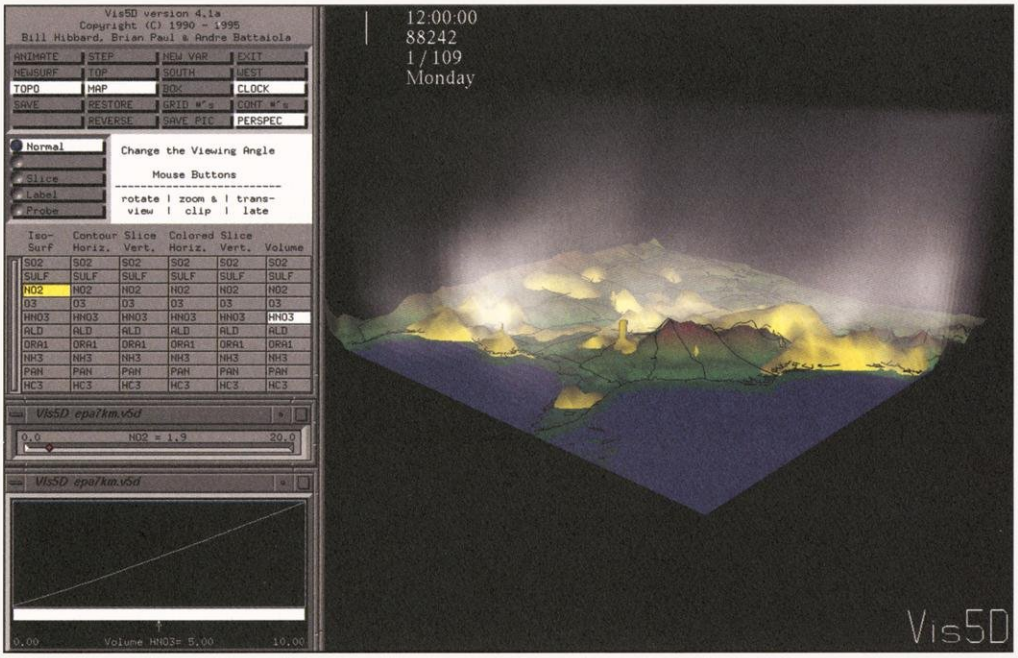
Motivated by limitations of the Vis5D system, the SSEC Visualization Project created VisAD to look at a greater variety of data in more flexible ways. For example, VisAD was used to analyze x-ray observations generated by the Diffuse X-ray Spectrometer (DXS) during its January 1993 flight on the space shuttle. In the picture to the right, each colored dot represents an x-ray that DXS instruments captured. In this image each dot's color represents the x-ray's longitude so the colored bands show how the instrument scanned back and forth over time. Much of the data collected by DXS was generated by spurious causes rather than true x-rays, and VisAD helped scientists differentiate good data from bad.



Each colored dot represents an x-ray that DXS instruments captured.

Both VisAD and Vis5D run on standard Unix platforms and are freely available over the Internet. More information about the SSEC Visualization Project is available on the World Wide Web at **http://www.ssec.wisc.edu/~billh/vis.html**

—William Hibbard



The yellow surface shows concentrations of a nitrous oxide produced by human activity, and the white cloud shows nitric acid produced when nitrous oxides react with moisture.

Context

SSEC's spaceflight experience began in the early 1960s with heat budget sensors on the first weather satellites. SSEC continues to design and build space- and ground-based instruments and the software to run them. In the 1990s, ground-based instruments include sounding instruments, lidar, and radar.

A recent major spaceflight program is the High Speed Photometer, a Hubble Space Telescope science instrument which precisely measured very rapid variations in the brightness of stars. Professor Robert Bless of UW–Madison's Department of Astronomy was principal investigator in this collaboration with the Space Astronomy Laboratory.

Among SSEC's newest projects is the control system for the WIYN telescope. Universities of Wisconsin, Indiana and Yale and the National Optical Astronomy Observatories formed a consortium (WIYN) to build and operate a new 3.5 meter telescope on Arizona's Kitt Peak. The new control system has made significant advances in the state of the art and is serving as a model for future telescopes.

Potential future projects include new applications of sounding technology, new space-flight astronomy instruments, a spectrometer to study Venus' atmosphere, a modified photometer for the Hubble Space Telescope and more ocean surface monitoring.

Jeff Miller, University News & Public Affairs

Investigators on the ocean buoy project with the prototype instrument: John Anderson, Lawrence Sromovsky, Verner Suomi. The team also includes Evan Richards, Fred Best and many others.

A Simple Sensor for Ocean Climate Data

One of the most elusive pieces of the climate and weather puzzle may be found by a simple oceangoing package of sensors the size and shape of a Frisbee. While scientists have long known that climate and weather are in large measure driven by the flow of heat from the ocean to the atmosphere, reliable measurements of this "heat flux" have been almost impossible to obtain. SSEC is developing an instrument, the brainchild of the late Verner Suomi, to measure this critical interface process.

This drifting ocean heat flux sensor could provide important clues to long-term climate issues and give insight into seasonal weather events such as hurricanes and the winter storms that frequently lash the eastern United States. "Most storms that strike the East Coast are driven by ocean heat fluxes. Heat flux is also an important part of the climate system," said John Anderson, a project investigator. "And while these measurements are critical, they are very hard to get and they are often inaccurate." For the planet as a whole, these measurements are crucial because most of the energy or heat directed at the earth by the sun is soaked up and stored in the oceans. Eventually, that heat is transferred to the atmosphere and at times the energy exchange is so dynamic it can give birth to hurricanes and, on a larger scale, influence climate and seasonal weather patterns.

The beauty of the new device is in its simplicity. It consists of a foam ring that serves as a float, and sheets of fiberglass mesh stretched across the float. Once wet, the mesh firmly holds a paper-thin suite of sensors just below the surface of the water in a thin layer where heat percolates upward by molecular conduction. It is in this layer that the sensors can best determine the flow of heat from the ocean to the atmosphere. Measurements are sent via a 30-foot floating tether to a buoy that houses batteries, a computer and a transmitter that relays a continuous stream of data to the polar-orbiting ARGOS satellite. By 1996, the heat flux sensor was tested in two freshwater lakes in Wisconsin, twice in the Gulf Stream in the Atlantic Ocean, and in a weather experiment off the Australian coast.

The prototype net flux sensor, developed with the support of Wisconsin's Sea Grant Institute and the National Science Foundation, seems to do its job reasonably well. But SSEC's development team has had to contend with unforeseen problems such as sea birds who mistake the sensor for something edible. "It's been brutalized by birds," said Anderson. "But that's a design problem we can solve."

—Terry Devitt,
UW–Madison News & Public Affairs

Seeing the Sky with X-ray Eyes

When we look at the sky with a telescope tuned to see low-energy x-rays, we find stars and galaxies just as with an optical telescope. However, unlike what we see with our eyes, the x-ray sky is not dark between the stars, but is filled with a diffuse cloudy glow called the x-ray background.

Much of the gas between the stars, the interstellar medium, in our part of the Galaxy has been heated to a temperature of a few million degrees, most likely by a nearby supernova explosion in the (astronomically speaking) recent past. This million degree gas sets the sky aglow in the light of x-rays.

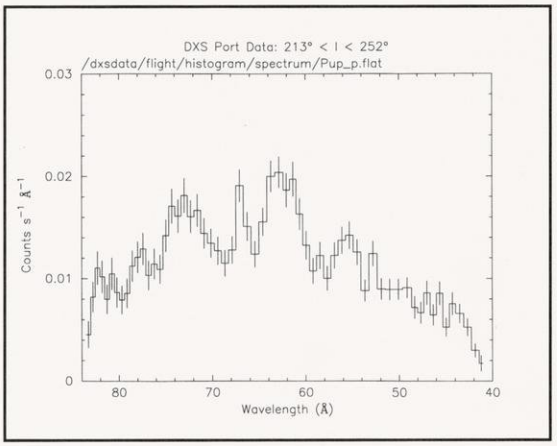
In January 1993, the Diffuse X-ray Spectrometer (DXS) experiment flew on Space Shuttle Endeavour in an eight-day mission to map the x-ray sky. The DXS dataset allows scientists to learn about the hot interstellar medium in the region of space for several hundred light years around the solar system.

The DXS instruments are unique because of their ability to sort detected x-rays by wavelength. The resulting distribution of how many x-rays are observed at each wavelength is called a spectrum. Different emission mechanisms produce different spectra. By observing the spectrum, we can learn about the physical processes that give rise to the x-rays.

The pattern of emission lines observed in the DXS data cannot be simply explained by assuming that a gas like that found in the sun has been at a temperature near a million degrees long enough to come into equilibrium. It is possible that some elements are missing from the gas (perhaps silicon and iron are in dust grains that have not yet evaporated). It is also possible that the gas is not yet ionized to the extent one would calculate based on its temperature, that is, it is approaching equilibrium, but is not there yet. Work is still in progress to distinguish between these two explanations, or to discover a better one. Either possibility sets limits on how long the gas has been hot, giving us a clue to the history of our part of the Galaxy.

If elements such as silicon and iron are mostly missing from the gas, it must have been heated within the last million years or so. If the ions are not yet in equilibrium with the temperature of the gas, the gas cannot have been hot for much more than a hundred thousand years. It seems unlikely that the supernova which heated this volume of gas was more recent than about 10,000 years ago, or there would be folklore about the explosion, as it must have been brighter than the moon.

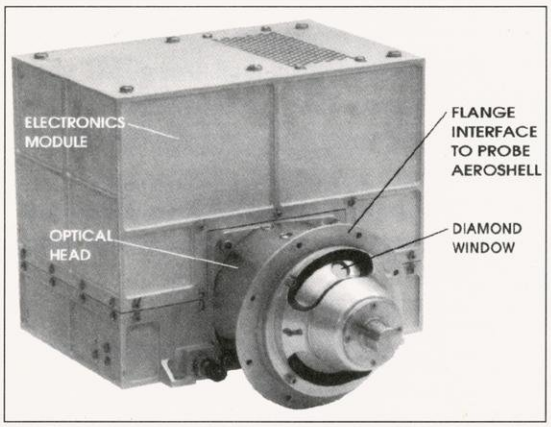
—Richard Edgar & Wilton Sanders, III



Wilton Sanders, III

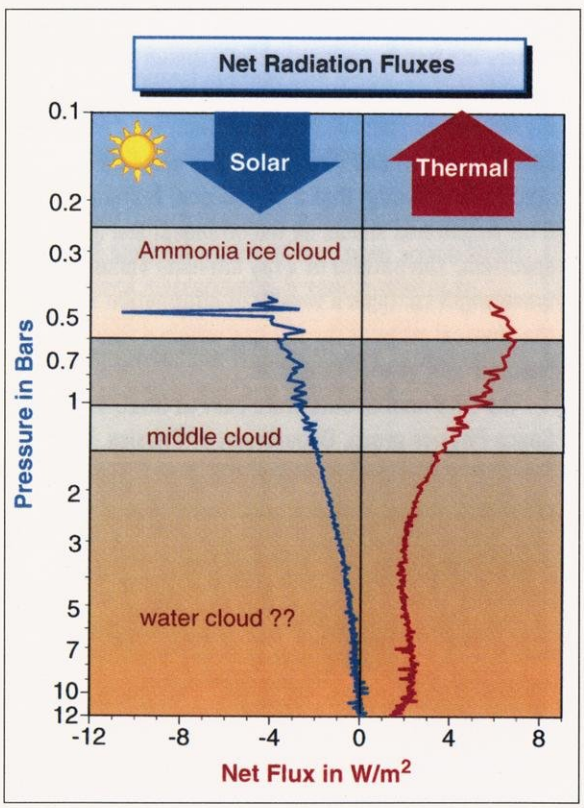
The DXS x-ray spectrum from the diffuse background in the constellation of Puppis shows the presence of narrow peaks, the first direct evidence of very hot gas in the interstellar medium near the solar system. The strong feature at a wavelength of 63 Angstroms coincides with emission lines from both S^{+7} (sulfur) and Fe^{+16} (iron). The simplest models predict (incorrectly) that a Si^{+7} (silicon) feature at 61.5 Angstroms should be the strongest line in the spectrum. The pattern of x-ray intensity versus wavelength contains a wealth of information about the physical state of the hot gas within a few hundred light years of the sun.

The DXS instruments were built at SSEC with the Space Physics group, Department of Physics. Wilton Sanders is principal investigator, Robert Paulos is program manager, Richard Edgar is project scientist.



Patrick Fry

This is the Net Flux Radiometer before insertion into the Galileo Probe.



Preliminary results from the Galileo Net Flux Radiometer indicate that an upper cloud layer of ammonia ice was present at the probe entry site.

Mission to Jupiter

After a circuitous two-billion mile six-year journey to Jupiter, the Galileo Mission's Atmospheric Probe finally entered the gas giant's alien atmosphere on December 7, 1995, making the first direct measurements of Jupiter's composition, clouds, structure, winds and radiation field. Surviving entry speeds of more than 106,000 mph, heat shield exposure to temperatures twice that of the Sun's surface, and deceleration forces of 230 gs, the Probe's scientific instruments sent one hour's worth of measurements to the Orbiter beginning at a pressure of 430 mb and reaching down to nearly 20 bars, a vertical distance of 135 km. The Orbiter later relayed the stored data back to earth, after attaining orbit around Jupiter.

This first man-made object to impact any giant planet carried an SSEC instrument, the Net Flux Radiometer, designed to measure upward and net fluxes of solar and the planet's own thermal radiation. It, and all scientific instruments on this, the most difficult planetary atmospheric entry ever attempted, operated successfully and sent back remarkable new data. The data from all the instruments will enable scientists to rethink theories of Jupiter's formation, the nature of planetary evolution, and what controls Jupiter's remarkable circulation and its earth-sized storm systems.

Net flux is the difference between the upward and downward flows of radiative energy. The change of net flux with altitude defines where the atmosphere is being heated or cooled by radiation. Because solar heating and longwave cooling usually take place at different locations and altitudes, they produce temperature and buoyancy differences within the atmosphere. These buoyancy differences provide the drive for atmospheric winds, both horizontal and vertical. Thus, the net flux measurements will provide information on how the winds on Jupiter are maintained. Because clouds and water vapor strongly interact with both solar and planetary radiation, thus affecting the local heating or cooling of the atmosphere, net radiation measurements also provide information about the distribution of cloud layers and water vapor.

In January 1996, preliminary results had been analyzed from the data received from the Probe. The figure (left) shows a profile of downward solar and upward thermal radiation. The blue curve shows directed sunlight detected by the NFR during its descent through the atmosphere. The red line on the right shows thermal emission directed upward from Jupiter. The pressure scale is noted on the left vertical axis. Atmospheric heating by radiation is indicated by the leftward tilt to the profiles, while radiative cooling is indicated by a tilt

to the right. The rapid variation in the downward solar radiation at the top is due to a component of the direct solar beam modulated by the spin of the probe. As the cloud thickness (opacity) above the probe increases during the probe descent, the cloud particle scattering attenuates the direct beam and this signature of the sun vanishes. The broad band thermal channel (shown as red) also indicated heating in the area where the solar modulation disappeared, consistent with a cloud base heated by radiation from below. The cloud layer detected by these observations is thought to be the expected ammonia cloud. The net flux radiometer showed no more clouds. The lack of thick clouds is probably a consequence of the probe having entered in, or at the edge of, a rather rare circulation feature, termed a "hot spot" because its unusually clear atmosphere permits radiation from deeper and warmer levels of Jupiter's atmosphere to be seen from above.

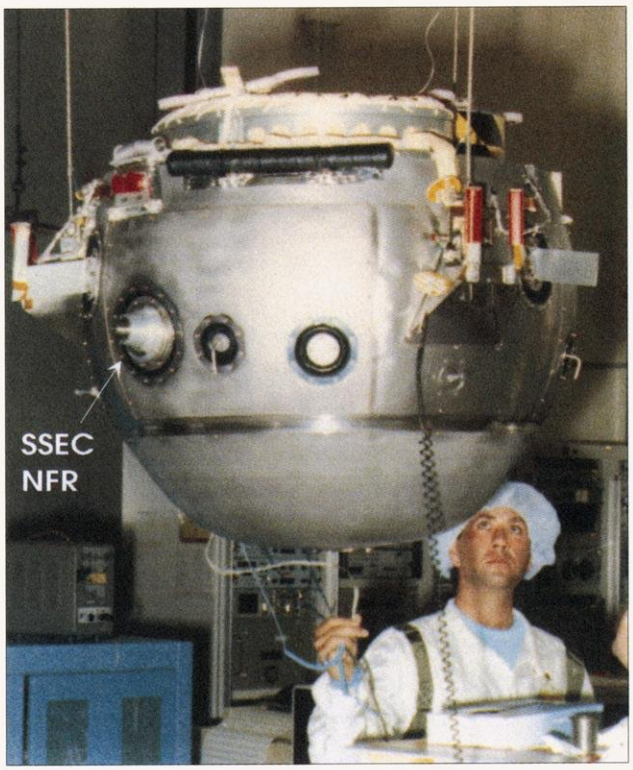
The level of planetary (thermal) fluxes significantly exceeded expectations based on pre-Galileo estimates for the amount of water vapor in the well mixed region of Jupiter's atmosphere, estimated at two to ten times the mixing ratio thought to be characteristic of the sun's composition. The NFR measurements appear at least crudely consistent with model calculations using much less than solar amounts of water and no significant middle cloud opacity.

Learn more about the Galileo Net Flux Radiometer, the Galileo mission, and Probe instrument results on the Internet at:

- http://www.ssec.wisc.edu/
- http://ccf.arc.nasa.gov/galileo_probe
- http://www.jpl.nasa.gov/galileo

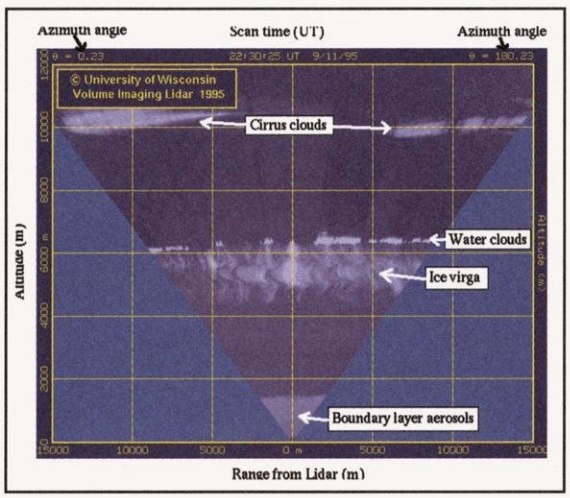
The NFR instrument was designed and built by Martin Marietta, Denver, Colorado, and later modified to incorporate design improvements developed at SSEC, where the instrument was calibrated. The investigator team is led by Principal Investigator, Lawrence Sromovsky. Co-investigators include Glenn Orton (JPL), Martin Tomasko (University of Arizona), Jeff Hayden (Martin Marietta Astronautics Group) and Henry Revercomb (SSEC). Fred Best was program manager for the SSEC development effort.

—Lawrence Sromovsky



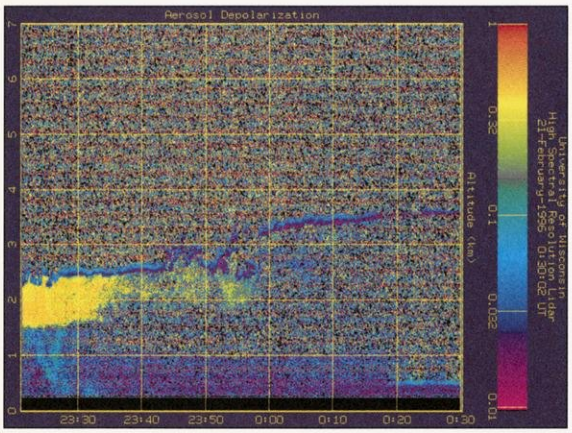
The Galileo Probe, with the Net Flux Radiometer and other scientific instruments, is shown being tested. NASA took the picture.

Imaging the Invisible Sky



Antti Piironen

Overhead scans such as this image from the Volume Imaging Lidar show backscatter signal in a vertical plane above the lidar.



Paivi Piironen

This image from the High Spectral Resolution Lidar shows the depolarization ratio as a function of time and altitude. The color scale (right) shows how large the depolarization is. Ice crystals and other irregularly shaped particles give 0.17-0.5 depolarization values (yellow). Mixtures of water and ice give depolarization values between pure water and ice (blue and cyan). Water clouds with small optical depths have low depolarization (purple). Multiple scattering at larger optical depth increases the depolarization with the penetration depth (purple to blue).

"We make what is invisible, visible," said Ed Eloranta. Eloranta's group at SSEC produces pictures of the sky that look nothing like what our eyes see. A picture on the wall of Eloranta's office may look like a towering cloud but is really a lidar image of a thermal plume, the phenomenon so familiar to sailors and hawks. Lidar instruments "see" other things equally invisible: tiny particles of dust, trace gases and microscopic water vapor droplets. At SSEC, the lidar group uses two systems, Volume Imaging Lidar (VIL) and High Spectral Resolution Lidar (HSRL).

Lidar (for light detection and ranging) is a laser instrument that uses computer-controlled scans and pulses to image large portions of the sky. The collected scans are analyzed for wind speed, cloud thickness and cloud structure. Lidar shows the amount of light penetrating and reflected by clouds. Because of lidar's precise imaging capabilities and sensitivity, it plays an important role in detecting, depicting and characterizing cloud cover. Predicting the effects of greenhouse gases, solar fluctuations and flash floods requires mathematical models that account for the influence of clouds. Satellites can collect much of this information, but lidar is needed to calibrate and verify the observations.

The VIL measures the drift of aerosols, the dust and other particles suspended in the air. By comparing successive images and computing their displacement, scientists can calculate wind profiles. From this data, precise wind speed and direction measurements are derived, providing important, hard-to-get information for mathematical models. Cutting across the sky through aerosols, the VIL maps the four-dimensional structure of the atmosphere, imaging the aggregate of all the tiny bits making up blue or hazy skies.

The HSRL can see even more. The beam of light returning to the observer can be split into aerosol and molecular scattered components which can be compared for a more accurate view of the atmosphere.

High powered computing equipment is necessary to handle the enormous volume of data. A typical field experiment can produce 20 to 30 gigabytes of data. This data is then compared with other data from the same experiment. SSEC's lidar group develops all their own software, equipment configuration and data gathering methodology.

In 1995, the HSRL was used in Arizona to study why precipitation falls where it does. This trip produced the HSRL's first rain data, now on CD-ROM, with an embedded link to the lidar Internet site: **http://lidar.ssec.wisc.edu**

—Terri Gregory

Advanced Atmospheric Sounders

Responding to the need for increasingly accurate forecasts, the U.S. satellite program continues to evolve. The next generation geostationary satellite to follow upon the current series of three-axis stabilized satellites (GOES-I through M) must carry a sounding instrument with vertical resolution and accuracy two to three times better than the current instrument. Two instruments developed by SSEC and its CIMSS group use interferometry to observe thermodynamic profiles of the atmosphere. By measuring interference patterns of atmospheric radiation created by a system of beam splitters and mirrors, an interferometer can measure the spectrum of radiation with the high resolution necessary to produce detailed temperature and moisture profiles.

The aircraft-based High resolution Interferometer Sounder (HIS) has flown in more than 100 flights on NASA's very high flying ER/2 since 1986, producing temperature and moisture structure (see right) for a wide variety of atmospheric conditions. HIS temperature and moisture profiles have been compared to collocated balloon profiles, showing the very high vertical resolution and accuracy of HIS measurements. The inclusion of this capability on future weather satellites will provide the mesoscale structure (weather events of 10–40 km) crucial to improving weather forecasting.

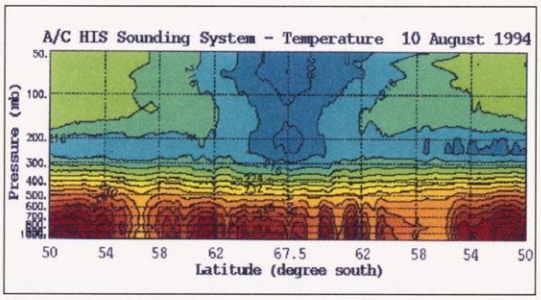
The ground-based Atmospheric Emitted Radiance Interferometer (AERI) is similar in basic design to HIS but measures downwelling atmospheric emitted radiance in the infrared region of the electromagnetic spectrum. The radiance spectra can be converted to thermodynamic quantities through profile retrieval algorithms similar to those used for HIS. Running in continuous operation, AERI measurements produce temperature and moisture profiles every ten minutes, building a continuous time-series of lower atmosphere structure and evolution (see bottom right).

AERI currently operates in an unattended, real-time mode, at a Department of Energy research site in Oklahoma. It has also been involved in several field programs taking atmospheric measurements, and in oceanic programs, looking at the sea surface from several viewing angles, to better understand sea surface emission characteristics as needed for the global mapping of ocean temperature from satellites.

—Thomas Achtor

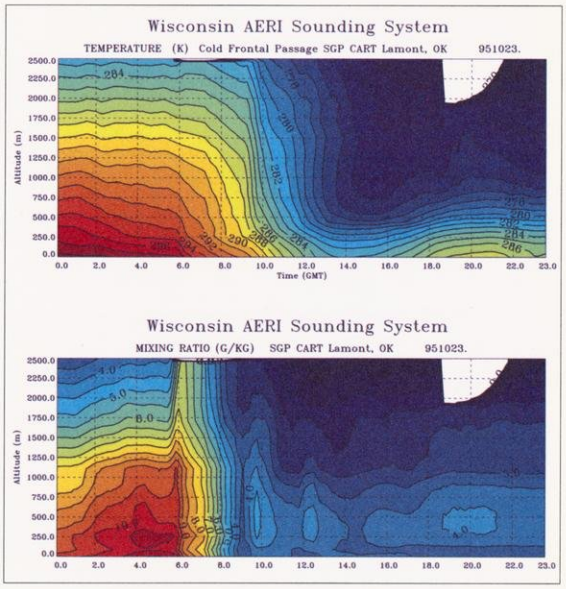
Henry Revercomb

Technician Robert Herbsleb inserts the aircraft prototype High resolution Interferometer Sounder in the ER/2 airplane's wing pod.



Timothy Olander

During the Airborne Southern Hemisphere Ozone Experiment, this cross section of temperature was made by the High resolution Interferometer Sounder.



Wayne Feltz

This AERI time series shows the atmospheric temperature and moisture structure in the lower troposphere for October 23, 1995. It depicts the passage of a cold front.

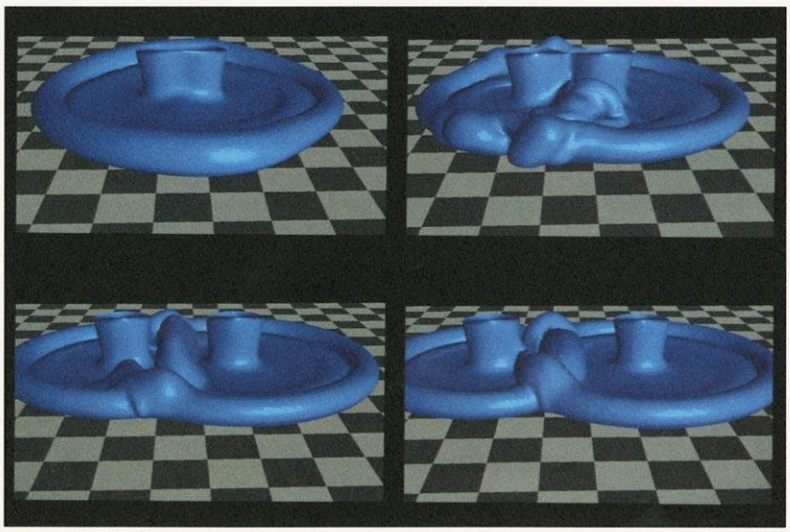
False Alarms, Wind Shear and Global Climate

Airport safety and global climate change are both aspects of SSEC researcher John Anderson's work. Anderson and his staff are involved in developing air traffic control and weather radars, and computer models for forecasting dangerous thunderstorm microbursts. The group also uses computer models to examine the interaction between the ocean and atmosphere and its role in global climate change.

Anderson designed the data processing algorithms, or computer procedures, for radars used at 120 major U.S. airports. Air traffic controllers use these radars to direct planes and to make severe weather forecasts. Pilots use them to locate and avoid heavy storms. Anderson's group is updating the data processing for these radars to provide better tracking of planes as they approach and leave the airport.

The latest generation of radars, the ASR-9, can screen out signals from objects other than moving planes so they are not displayed on the radar screen. Signals from stationary objects, such as buildings or mountains, are called clutter. Signals from moving objects other than planes, such as ground traffic or flocks of birds, are called false alarms. Current research advancing clutter and false alarm suppression gives air traffic controllers increasingly reliable readings of the sky surrounding their airports.

Current SSEC work on the ASR-9 radars is focused on improving severe weather reporting. Radars can detect rainfall intensity and wind velocity. Pilots use this information to avoid heavy storms; air traffic controllers use it to warn incoming and outgoing planes of severe weather and the



John Anderson

This computer simulation shows colliding microburst events.

potential for wind shear, which has been implicated in many high-fatality aircraft crashes. This rapid change in wind speed or direction is often caused by small thunderstorm downbursts known as microbursts. Microbursts are a deadly threat to planes because the rapidly changing wind patterns can be very confusing to pilots. A microburst is a wind gust of rapidly falling air that fans out horizontally as it reaches the ground. This can affect airplanes dramatically during takeoff and landing.

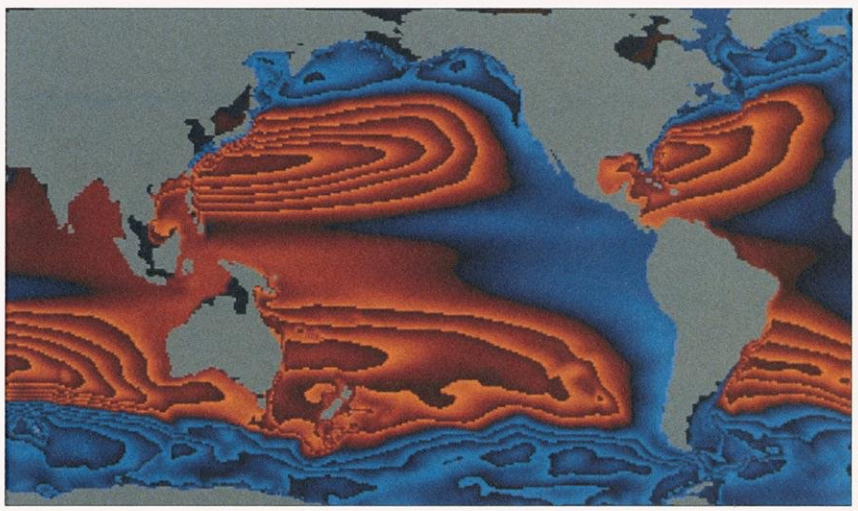
As a plane enters a microburst, it first encounters a headwind giving the plane additional lift and airspeed. Then, at the center of the microburst, a downdraft pushes the plane down. Finally, the plane encounters a tailwind that robs it of airspeed and lift. The downdraft and tailwind can cause a crash if the plane loses too much altitude.

Anderson's research group is using weather radar data to develop computer models that simulate the development of microbursts. These simulations can be used to forecast microbursts. Using real radar data, the models produce ten-minute forecasts. These short-term forecasts provide warnings for microburst and windshear potential or occurrence within ten to twenty miles of the airport.

Predicting the development of multiple microbursts is the subject for additional research. Colliding microbursts are rarer than single microbursts but have caused many accidents. This research has helped develop an understanding of the wind dynamics of colliding microbursts and how they can be detected.

Funding for the microburst, air traffic, and weather radar improvement research is provided by the U.S. Federal Aviation Administration. The work is performed collaboratively with Massachusetts Institute of Technology's Lincoln Laboratory.

—Anne Notestein



John Anderson

Anderson's latest project, a coupled ocean/atmosphere computer model, produced this simulation of the world's oceans. This model simulates ocean-atmosphere interactions over 10,000 years. It examines the exchange of heat, moisture, and energy between the atmosphere and ocean. The 10,000-year model will take up to a year to run, even using a high performance computer. Results from this model will aid understanding of climate fluctuations over centuries. They may also help to determine whether global warming is indeed occurring or simply a part of longer term oscillations in climate. SSEC and Argonne National Laboratory are collaborating on the project, which is funded by the U.S. Department of Energy.

Acronyms and Abbreviations

CIMSS	Cooperative Institute for Meteorological Satellite Studies
cm	centimeter
DOE	Department of Energy
DXS	Diffuse X-ray Spectrometer
EPA	Environmental Protection Agency
ER/2	Earth Resources plane, 2
ERBE	Earth Radiation Budget Experiment
gs	A g is the measure of Earth's gravitational force
Gb	Gigabytes
GOES	Geostationary Operational Environmental Satellite
HIS	High resolution Interferometer Sounder
JPL	Jet Propulsion Laboratory
km	kilometer
knts	knots
Lidar	Light Detection and Ranging
mb	millibar
McIDAS	Man computer Interactive Data Access System
MODIS	Moderate Resolution Imaging Spectroradiometer
NASA	National Aeronautics and Space Administration
NOAA	National Oceanic and Atmospheric Administration
NSF	National Science Foundation
SSEC	Space Science and Engineering Center
TPC	Tropical Prediction Center
WIYN	Wisconsin-Indiana-Yale-National Optical Astronomy Observatories
WSGC	Wisconsin Space Grant Consortium

University archives

The late Professor Verner E. Suomi, second from right, in white, measured the heat budget of a corn field in 1957. From such earthly beginnings, SSEC grew to measure and observe aspects of Earth, many of the other planets, and the galaxy.

Credits

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HOLD FOR RELEASE SATURDAY, FEB. 10, 1996

CONTACT: John R. Anderson, (608) 262-0783, anderson@ssec.wisc.edu

SIMPLE SENSOR PROMISES ELUSIVE BUT CRITICAL CLIMATE DATA

BALTIMORE — For scientists, one of the most elusive pieces of the climate and weather puzzle may soon be made available by a simple oceangoing package of sensors the size and shape of a Frisbee.

While scientists have long known that climate and weather are in large measure driven by the flow of heat from the ocean to the atmosphere, reliable measurements of this "heat flux" have been almost impossible to obtain, according to John R. Anderson, a University of Wisconsin-Madison professor of atmospheric and oceanic sciences and an associate director of the UW-Madison Space Science and Engineering Center.

Addressing scientists here today at the annual meeting of the American Association for the Advancement of Science, Anderson described the development of a drifting ocean heat flux sensor that could provide important clues to long-term climate issues as well as insight into seasonal weather events such as hurricanes and the winter storms that frequently lash the eastern United States.

"Most storms that strike the East Coast are driven by ocean heat fluxes. Heat flux is also an important part of the climate system," Anderson said. "And while these measurements are critical, they are very hard to get and they are often inaccurate."

For the planet as a whole, these measurements are crucial because most of the energy or heat directed at the Earth by the sun is soaked up and stored in the oceans. Eventually,

-more-

that heat is transferred to the atmosphere and at times the energy exchange is so dynamic it can give birth to hurricanes and, on a larger scale, influence climate and seasonal weather patterns.

For example, heat flux associated with El Niño events in the Pacific Ocean is not well understood. El Niño events are widely believed to have significant influence on seasonal weather and climate.

The beauty of the new device, says Anderson, is in its simplicity. It consists of a foam ring that serves as a float, and sheets of fiberglass mesh stretched across the float and that, once wet, firmly hold a paper-thin suite of sensors just below the surface of the water.

It is there, according to Anderson, where heat percolates up by a process known as molecular conduction. It is in this realm that the sensors can best determine the flow of heat from the ocean to the atmosphere.

Measurements are sent via a 30-foot floating tether to a buoy that houses batteries, a computer and a transmitter that relays a continuous stream of data to the polar-orbiting ARGOS satellite.

So far, the heat flux sensor has been tested in two freshwater lakes in Wisconsin and twice in the Gulf Stream in the Atlantic Ocean. Last Friday (Feb. 2) another was shipped to Pago Pago in American Samoa for deployment in the Pacific.

The new sensor was the brainchild of the late Verner E. Suomi, a UW-Madison scientist known for his simple but far-reaching inventions and who is widely credited with developing the technologies that made weather satellites possible.

According to Anderson, the prototype net flux sensor, being developed with the support of the National Science Foundation, seems to do its job reasonably well. But the development team at Wisconsin's Space Science and Engineering Center has had to contend with unforeseen problems such as seagulls who mistake the sensor for something edible.

"It's been brutalized by birds," said Anderson. "But that's a design problem we can solve."

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— Terry Devitt, (608) 262-8282, trdevitt@facstaff.wisc.edu

(Editor's note: B/W photos available upon request. Please call Jeff Miller at (608) 262-0067)

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Jan. 18, 1996

TO: **Editors, news directors**
FROM: **Terry Devitt, (608) 262-8282**
RE: **Galileo Probe news conference**

Once again, the National Aeronautics and Space Administration (NASA) has scheduled a news conference at which preliminary results from the recent atmospheric probe of Jupiter will be released. According to NASA, the news conference has now been scheduled for Monday, Jan. 22, 1996 at Noon CST.

Larry Sromovsky, a scientist at UW-Madison's Space Science and Engineering Center and the principal investigator for the Net Flux Radiometer, one of the instruments aboard the probe, is scheduled to participate.

The news conference will be broadcast live on NASA TV from NASA's Ames Research Center at Moffett Field, California. The space agency's satellite television network can be accessed through the following coordinates:

GTE Spacenet 2
Transponder 5 (channel 9)
Frequency: 3880 MHz
Orbital Position: 69 degrees West Longitude
Audio: 6.8 MHz

Any media without direct access to a satellite dish are welcome to view the news conference in the 3rd Floor Conference Room (Room 351) of UW-Madison's Atmospheric Oceanic and Space Science building on the corner of Orchard and Dayton streets. The contact at UW-Madison's Space Science and Engineering Center is Terri Gregory. She can be reached at (608) 263-3373 if you have questions about parking or other aspects of the event. The Public Affairs contact at NASA's Ames Research Center is Ann Hutchison, (415) 604-4968.

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FOR IMMEDIATE RELEASE **11/22/95**

CONTACT: Sanjay S. Limaye, (608) 262-9541

UW SCIENTIST TO SCAN ENTRY SITE WITH SOLAR TELESCOPE

MADISON — A glitch with the tape recorder used to store scientific data aboard the Galileo spacecraft has given University of Wisconsin-Madison planetary scientist Sanjay Limaye an unusual opportunity.

Limaye, of UW-Madison's Space Science and Engineering Center, will be serving as a stand-in of sorts for Galileo's sophisticated cameras, which will be unable to observe the planet as its atmospheric probe samples the Jovian atmosphere beginning Dec. 7, 1995.

Limaye will be leaving Madison Nov. 26, for the Canary Islands where he will set up shop at the Swedish Solar Telescope. There he will observe the point on Jupiter — an ellipse-shaped area near the Jovian equator measuring 200 kilometers by 300 kilometers — where Galileo's instrument-laden capsule will penetrate the dense atmosphere of the largest planet in the solar system.

Scientists would like to have other observations to draw on as they evaluate data sent back by the capsule, which will provide the first-ever direct measurements of the Jovian atmosphere.

Initial plans called for cameras aboard the sophisticated Galileo spacecraft to make those observations, but because of a problem with a tape recorder used to store scientific

-more-

data, all the available memory aboard the craft will be used to store information telemetered from the atmospheric probe as it makes its descent through the stormy Jovian atmosphere.

A solar telescope is useful, said Limaye, because, at present from the Earth, Jupiter is too close to the Sun to observe with traditional telescopes. The Hubble Space Telescope is also unable to view Jupiter this close to the Sun, but several ground-based infrared telescopes, equipped with special plastic shields, will make observations.

A solar telescope, with an evacuated tube to minimize the distorting convection currents generated by the heat of the Sun and very fast exposure times, should be able to provide good independent observations of the entry site. Limaye's success will also depend on good weather in the Canary Islands.

"It's going to be a challenge because we're going to observe Jupiter close to the Sun and I don't think that has ever been done before," said Limaye. "Jupiter is a dynamic planet. Storms and other changes in the atmosphere occur fairly quickly. It's crucial for us to know what kind of a cloud system the probe is entering."

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— Terry Devitt, (608) 262-8282

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Galileo Mission to Jupiter
University of Wisconsin-Madison
Space Science and Engineering Center
Net Flux Radiometer

The Mission: Galileo, a 2.5-ton, $1.5-billion spacecraft, is the most ambitious interplanetary mission in the history of space flight. En route to Jupiter for the past six years, the spacecraft and a recently deployed entry probe will rendezvous with the largest planet in our solar system Dec. 7, 1995. It will enable planetary scientists to study the planet and some of its 15 known moons at close range. Its atmospheric probe, an instrument-packed capsule that will penetrate and sample the Jovian atmosphere, will provide scientists with their first-ever direct measurements of the atmosphere of one of the giant outer planets. The mission will help scientists learn about Jupiter's violent weather and atmosphere and, since Jupiter has changed little since it was formed more than 4 billion years ago, may also provide some insight into the early conditions of our solar system.

The Planet: Jupiter is the largest planet in the solar system and the fifth in distance from the Sun. It has 15 known moons. The planet itself resembles a huge spinning ball of gas and liquid. It has more mass than all of the other planets combined. Its Great Red Spot, a raging storm system in the southern hemisphere, is nearly three times the size of the Earth. The Jovian atmosphere is believed to have at least three cloud levels, each composed of different chemical constituents. The lowest level has clouds consisting of water, the next has clouds of ammonium hydrosulfide, and the highest has clouds of ammonia. The gas planets, such as Jupiter, do not have solid surfaces. Their gaseous material simply gets denser with depth. Jupiter is about 90 percent hydrogen and 10 percent helium and has traces of methane, water and ammonia. This is close to the composition of the primordial Solar Nebula from which our entire solar system was formed.

The Net Flux Radiometer: Aboard Galileo's entry probe is a device called the Net Flux Radiometer. Developed in part by UW-Madison scientists, the Net Flux Radiometer is designed to sample the thermal and solar radiation of the planet as the probe descends through the deep Jovian atmosphere. This device will perform some of the first direct measurements of Jupiter's atmosphere. The UW-Madison device will also measure water vapor and cloud structure.

For More Information: Visit our web site at http://www.ssec.wisc.edu/; or contact Terry Devitt, (608) 262-8282, trdevitt@facstaff.wisc.edu; or Terri Gregory, (608) 263-3373, terri.gregory@ssec.wisc.edu

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GALILEO PROBE
UW EXPERIMENT POISED TO SAMPLE JUPITER'S STORMY WEATHER

MADISON — Completing a six-year journey through the solar system, a University of Wisconsin-Madison experiment is poised to take the first direct radiation measurements of the stormy atmosphere of Jupiter.

The experiment, known as the Net Flux Radiometer, is one of a cluster of sensors aboard a capsule rocketing toward the largest planet in the solar system.

Jettisoned by the Galileo spacecraft July 13, the capsule or entry probe will slam into Jupiter's atmosphere Dec. 7 at 115,000 miles per hour and for 75 minutes will sample its stormy atmosphere, descending 372 miles before it is crushed and vaporized by the planet's atmospheric extremes.

The UW-Madison experiment is part of NASA's $1.5 billion Galileo mission, considered the most ambitious interplanetary undertaking in the history of space flight. Galileo, a 2.5-ton spacecraft consisting of an orbiting vehicle and the instrument-laden atmospheric probe, will be the first to orbit Jupiter and the first to directly investigate its atmosphere.

The $6-million Net Flux Radiometer, built at UW-Madison's Space Science and Engineering Center, is designed to measure the radiation that reaches Jupiter from the Sun as well as the thermal radiation or heat generated by the planet itself, a relic of its

-more-

formation.

From measurements of how radiated energy — from both Jupiter and the Sun — is exchanged in the atmosphere, a team headed by UW-Madison scientist Lawrence A. Sromovsky hopes to determine where the atmosphere is being heated and cooled, and the roles of solar and internal heat sources in driving atmospheric motions.

"The main purpose of the Net Flux Radiometer is to define the heat engine that runs the planet's circulation," Sromovsky said.

The radiometer measurements will also help define the location and characteristics of cloud layers, and the amount of water vapor in Jupiter's atmosphere.

When combined with measurements from other probe experiments that measure winds, temperature, pressure, chemical composition, cloud particles and lightning, data from the Net Flux Radiometer will give scientists a new understanding of weather that is unlike anything on Earth.

The bizarre weather of Jupiter is characterized by giant storms, including one more than twice as big as the Earth and that has raged for more than 300 years, several layers of chemically distinct clouds, and alternating bands of high-speed winds — up to 300 miles an hour — that seem to change abruptly and uniformly with latitude.

Moreover, the planet's composition — 90 percent hydrogen and 10 percent helium with traces of other chemicals — still retains clues about the cloud of dust and gas from which the sun and planets formed. The first direct measurements of Jupiter's atmosphere may thus yield a better idea of what the early solar system was like and how planet formation took place, said Sromovsky.

The 745-pound capsule with the Net Flux Radiometer on board is on a trajectory aimed at a spot just north of Jupiter's equator. On Dec. 7, the capsule will slice into the

ammonia ice clouds of Jupiter's upper atmosphere. Within minutes friction will slow the craft to 100 miles per hour and the capsule will deploy a parachute and drift through multiple cloud layers to the dense atmosphere below.

"The probe will be entering in a region where the cloud structure can be quite variable," Sromovsky said.

Beneath the uppermost ammonia cloud layer, scientists think they may find at least two other layers of clouds, one composed of ammonium hydrosulfide and a layer composed of a mixture of ice and water. Finding the location of clouds, and the location and amount of water vapor will be an important diagnostic of Jovian weather, said Sromovsky.

"This will be our first look beneath Jupiter's clouds and we are bound to get a few surprises," Sromovsky said. "The real challenge will be to relate this one detailed vertical profile of observations to conditions elsewhere on a very large and complex planet. It's a problem akin to figuring out the Earth's weather from observations made by a single weather balloon."

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— Terry Devitt, (608) 262-8282

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NEWS

UNIVERSITY OF WISCONSIN–MADISON

Space Science Engineering Center

Phone: 608/262-3571
Fax: 608/262-2331

Office of News and Public Affairs
28 Bascom Hall • 500 Lincoln Drive
Madison, Wisconsin 53706-1380

FOR IMMEDIATE RELEASE 10/25/95

CONTACT: William L. Hibbard (608) 263-4427, whibbard@macc.wisc.edu

TODAY'S FORECAST:
A CHANCE FOR ACID RAIN WITH PATCHES OF OZONE

MADISON — By harnessing the same computer graphics technology that Hollywood uses to create special effects and animation, scientists are developing interactive images of air pollution.

The pictures look much like the satellite weather maps shown on the evening news, but instead of depicting storms and other weather cells, the animated, three-dimensional images show the otherwise invisible clouds of chemicals that blanket much of the industrialized world.

The pictures are derived by combining a sophisticated computer graphics program with the wealth of data of the Earth's atmosphere collected by satellites and other means, says William L. Hibbard, a staff scientist at the University of Wisconsin-Madison's Space Science and Engineering Center and a developer of the new software.

The technology — which can be adapted to model the transparent but critical process of the oceans and atmosphere as well — is being widely adopted by scientists and government agencies worldwide, according to Hibbard.

"It is conceivable that one day pollution maps may be as ubiquitous as weather maps are today," he says. "It is possible now to model pollution very quickly, almost instantly."

Through satellites, radar and other technologies, scientists have long had the

-more-

ability to measure and create mathematical models of chemicals in the atmosphere. By providing a tool to blend those measurements and models into three-dimensional, interactive maps, scientists can better assess the degree of air pollution, chemical interactions in the atmosphere, and what role the weather plays in dispersing and mixing chemical pollutants, says Hibbard.

"The data for any pollutant — ozone, carbon dioxide, sulfur dioxide — can be used to create a model," he says. "The problem for scientists is that the data sets are huge. It's like drinking from a fire hose."

Already, the "chemical meteorology" software is being used by scientists at the U.S. Environmental Protection Agency (EPA) to model such pollutants as ozone, nitrogen, sulfur and volatile organic compounds.

"It allows you to see pollution as a cloud," says Robin Dennis, a research scientist at the EPA's National Exposure Research Laboratory in Research Triangle Park, N.C. "We're looking at complex, intertwined environmental problems and these kinds of tools are essential for us to begin to understand them."

The Wisconsin computer graphics software is a way to funnel all of that information into an easy-to-digest map or animated picture, Hibbard says.

Dennis says the software is a way to make air pollution data sets — sometimes as large as 100 million numbers and growing — digestible by the human brain. "The way to do that," says Dennis, "is to turn the numbers into pictures and that's what this software does."

Moreover, the software gives scientists a three-dimensional window through which to view dynamic processes, something very hard to do without visualization.

Hibbard cites the atmospheric chemical ozone as an example.

"The problem with ozone is that we have too much at low levels of the atmosphere and too little at high levels. The three-dimensional graphics provide a way to understand the relationship of ozone at different vertical levels," he says. "Also, scientists can use it to test their own ideas of what's going on in the atmosphere."

If the data sets are available, the free computer graphics software, known as Vis5D, can create maps and images at very fine scales. For instance, a single chemical pollutant from a single source such as a refinery or power plant could be imaged and mapped is the data set has sufficiently high resolution, Hibbard says.

###

— Terry Devitt, (608) 262-8282

Space Science + Engineering Center

WISCONSIN WEEK
October 25, 1995
For Faculty & Staff
University of Wisconsin-Madison

Connection: Successful

UW adds modems to keep up with demand on state's largest dial pool

Peggy Merrick-Bakken
Division of Information Technology

One of the largest university "dial pools," which allows faculty, staff and students to connect to the Internet from remote locations, just got bigger.

Information Technology

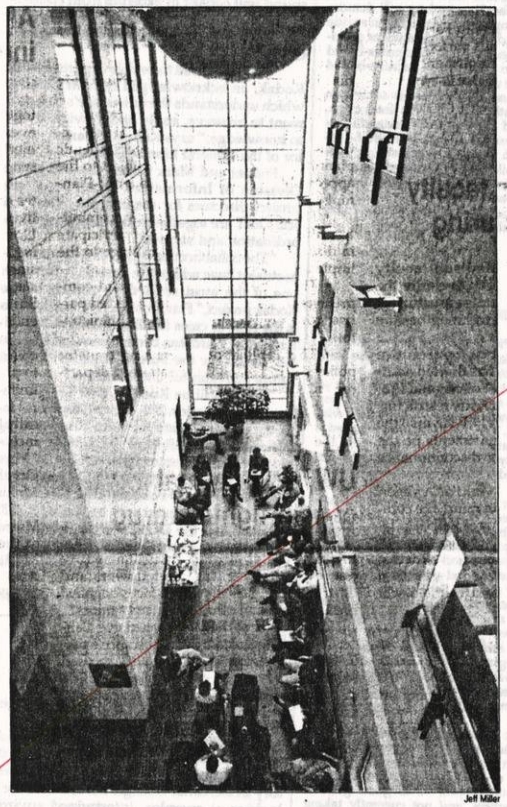
The next wave in lecture notes.

see back page

The Division of Information Technology (DoIT) has installed 96 new modems for a total of 624 modems online to meet the overwhelming demand. The dial pool, run by DoIT, is the largest in the state and ranks among the largest maintained by universities across the country.

Use of WiscWorld, the university's on-line Internet service, is setting new records and causing growing pains for campus users. On a typical day this semester, between 18,000 and 20,000 successful

see DIAL, back page



Jeff Miller

Open wide

Wait is over for state-of-the-art biotechnology and genetics building

Brian Mattmiller

UW-Madison's long-awaited research building for biotechnology and genetics is open for business, providing a new infusion of high-quality laboratory and teaching space.

The five-story Genetics/Biotechnology Center building, 425 Henry Mall, will offer the biological sciences community 80,000 square feet of working space, including 41 lab modules, a multimedia auditorium, a computer laboratory and other state-of-the-art research facilities.

"From the standpoint of biology research, this is a first-rate facility," says Carter Denniston, chair of the Laboratory of Genetics. "We needed not only better space, but more space. The average researcher in genetics needs more room to house all the modern equipment used in today's research."

The Laboratory of Genetics, the Biotechnology Center and the Center for Biology Education are all housed in the new building. In addition to bringing these similar units together for the first time, the building provides a modern showcase for teaching, research and service in the biological sciences.

"The best advantage is putting the Biotechnology Center in the heart of campus," says the center's director, Richard Burgess. "More than 800 faculty are involved in some aspect of biological sciences, and this new building will provide a first-rate environment for serving the biological enterprise."

The Biotechnology Center provides a variety of shared services for researchers, such as DNA and protein synthesis and sequencing, transgenic animals, bioseparations and specialized tools for research.

It also emphasizes outreach by working with Wisconsin schools on biotechnology education. The center works closely with the campus research community, University-Industry Relations (UIR) and the Wisconsin Alumni Research Foundation (WARF) in transferring technology to Wisconsin industry.

The center has an active research program in the Plant Biotechnology Laboratory. One study is working to produce industrial enzymes by using Wisconsin alfalfa fields as "enzyme factories," says Burgess. Those enzymes can be used to break down toxins in the soil and waste streams.

see OPENING, page 4

Occupants of the new Genetics/Biotechnology Center met last week in the four-story atrium to get acquainted with each other and building facilities.

Inside

Smog never looked so good

Software gives pollution graphical feel

Terry Devitt

By harnessing the same computer graphics technology that Hollywood uses to create special effects and animation, scientists are developing interactive images of air pollution.

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"The data for any pollutant — ozone, carbon dioxide, sulfur dioxide — can be used to create a model," he says. "The problem for scientists is that the data sets are huge. It's like drinking from a fire hose."

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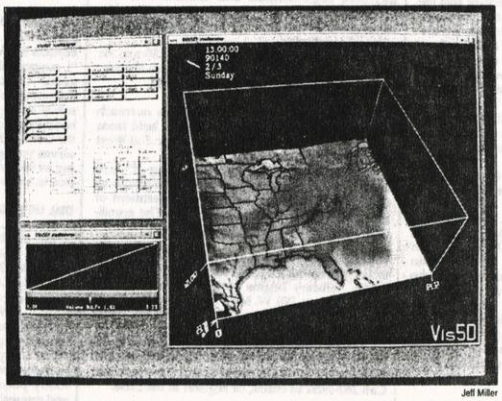
see POLLUTION, page 9



Jeff Miller

The Space Science and Engineering Center's software can turn any set of pollution data into a three-dimensional interactive map, giving scientists a bird's-eye view of the pollution – problem.

Lectures

Last human on moon lands at UW Nov. 7

Apollo astronaut Harrison "Jack" Schmitt, the last human to set foot on the moon, will give a public lecture Nov. 7, at 7 p.m., in 1610 Engineering Hall.

The lecture, titled "A Trip to the Moon", will explore the Apollo 17 mission and the value of future space exploration.

Schmitt is an adjunct professor in the College of Engineering's Department of Nuclear Engineering and Engineering Physics. He and colleagues will be teaching a course in spring semester titled "Resources from Space," focusing on the value of space exploration.

Schmitt, a graduate of the California Institute of Technology and Harvard, joined the astronaut corps in 1965. After returning from the Apollo 17 mission in December 1972, he directed NASA's Scientist Astronaut Office and Office of Energy Programs until 1975. In 1976 he became a U.S. senator representing New Mexico. He left the Senate in 1982 and has been working as a businessman, consultant and speaker.

For more information, contact Gerald Kulcinski at 263-2308.

Chadwick to address politics, religion

One of the world's most distinguished ecclesiastical historians will discuss the relationship between "Religion and Nationalism," Nov. 6.

Owen Chadwick, professor emeritus at Cambridge University, is the author of *The Christian Church and the Cold War* (1992). He also is active in the Church of England, and was a close friend and biographer of Michael Ramsey, the late Archbishop of Canterbury.

Chadwick's lecture, at 1:30 p.m. in the Curti Lounge, 5233 Humanities Building, is free and open to the public.

For more information, contact Robert Kingdon, 262-6119 or 262-3855.

Landscape and Memory: The Merle Curti Lectures

Simon Schama, a distinguished historian and author who declares that the natural landscape is the "carrier of memory," will deliver the 1995-96 Merle Curti Lectures Nov. 13-15 at the State Historical Society.

A professor of history at Columbia University, Schama will explore the theme "Landscape and Memory," also the title of his most recent book. Schama's storyteller explorations of forests, rivers and mountains range across much of Western history, from the ancient world to the 20th century.

The lectures are "Forest and Tribe" (Nov. 13, with a public reception to follow), "The Flow of Life " (Nov. 14) and "Altitudes and Empire" (Nov. 15). All will begin at 4 p.m. in the society's auditorium and are open to the public.

The Curti Lectures are sponsored by the Department of History and are named in honor of Merle Curti, emeritus professor of history.

For more information, call Jean Lee at 263-1828.

course is approved for 6.25 hours of Continuing Education credit for appraisers from the State of Wisconsin, Department of Regulation and Licensing.). The course fee is $195.

"Real Estate Investment and Feasibility Analysis: An Introduction with Applications" will be presented Dec. 7-8 in Grainger Hall. This program is designed for individuals involved in commercial real estate who require a comprehensive knowledge of techniques used to evaluate real estate investment opportunities. Topics include an introduction to investment analysis, a discussion of traditional investment criteria, and an examination of the Internal Rate of Return (IRR) and modified IRR.

Participants will become familiar with how investment criteria are used to structure real estate deals by considering the effect of leverage, understanding the difference between investment value and market value, and learning how to partition the IRR. The program concludes by considering types of risks, and how mean-variance analysis and sensitivity analysis can be used to measure and understand risk. The course is approved for 15 hours of Continuing Education credit for appraisers from the State of Wisconsin, Department of Regulation and Licensing. Course fee is $395.

For registration information or brochures, contact Leah Leighty at 265-2032 or fax 265-2738.

BLACK HOLES AND TIME WARPS: A UW-Madison outreach course, "Kip Thorne's Black Holes and Time Warps," will be held from 7 to 9 p.m., on Wednesdays, Nov. 15-Dec. 20, at the Wisconsin Center. The course is designed for people who want a deeper treatment of relativity, black holes and big-bang cosmology than is offered in the popular outreach course "Stephen Hawking's A Brief History of Time." High school math is the only prerequisite. The instructor is Mark Bernstein, Liberal Studies. The enrollment fee is $60. Call 262-2152.

WEEKEND WONDERS: Faculty and staff and others interested in learning about past and contemporary "wonders of the world" or in the history of Germany may attend two upcoming UW-Madison outreach weekend seminars at the St. Benedict Center in Middleton.

"Wonders, Wonders, and More Wonders," Dec. 1-2, will look at the seven ancient "wonders of the world" as well as wonders added to the list in more recent years, such as the Great Wall of China, and some contemporary wonders that define the limits of our power to shape our future. Lecturers will include: John Klus, professor of engineering; Robert Schacht, professor, Liberal Studies; and Ann Gehring, amateur Egyptologist and docent at the Milwaukee Art Museum.

The second seminar, "Germany: A Twice-Born Phoenix," Dec. 8-9, focuses on the history of Germany, including its art, the prelude to Nazism, the two Germanys following World War II, and the challenges of reunification begun in 1989. Lecturers will include: Theodore Hamerow, UW-Madison professor emeritus of history; Schacht and Gehring.

Activities for both weekends will begin with dinner on Friday night and conclude around 4 p.m. on Saturday. Registration is $40; meals and lodging are extra. Call 262-2152.

CERTIFIED PUBLIC MANAGERS: Faculty and staff who serve in administrative or managerial positions within the university may now enroll in the Wisconsin Certified Public Manager (WCPM) Program. A comprehensive program that leads to nationally recognized certification, WCPM is administered by UW-Madison's Governmental Affairs Unit in cooperation with other UW campuses.

The all-day classes available during November are "Organization Performance Measurement," Nov. 1; "Working with Councils, Boards and Commissions," Nov. 14; and "Media Relations," Nov. 15. For more information about the WCPM program and specific courses, call 262-3830.

BRIDGING DIVERSITY: A two-day UW-Madison outreach workshop, "Common Differences: Building Bridges Across Diversity," will offer participants a safe environment to examine differences and commonalties among people. Topics will include racism, classism, sexism, homophobia and how people are affected by each in the home, workplace and community. It will also help participants learn strategies for creating inclusive organizations and communities. Instructors are Kathy Germann and Brenda Rodriguez, consultants in conflict resolution and cultural sensitivity.

The workshop will be held from 8:30 a.m. to 4:30 p.m., Nov. 16-17 at the Wisconsin Center. The enrollment fee is $145. Call 262-7942.

CONVERSATIONAL FRENCH CLASS: An outreach conversational class in French will be held from 6:45-8:15 p.m. on Tuesdays, Oct. 31-Dec. 5 at West High School, 30 Ash St.

Participants in "French: Beginning II" will learn how to converse in French in social and cultural situations. Irene Geller, Department of Liberal Studies, will teach the class. The enrollment fee is $46. Call 262-2452 to enroll.

THIRD SERIES OF BOOK TALKS BEGINS: The third series of this fall's Monday Morning Book Talks at the Library begins Nov. 6 at the Madison Public Library, 201 W. Mifflin. "George Sand and Beyond" will explore works by Sand, Doris Lessing, and Marge Piercy.

Laurel Yourke, Department of Liberal Studies, will lead the discussions. Sessions are from 9:30 to 11 a.m., Nov. 6-20. The series costs $22. Call 262-2452 to enroll, or register at the class.

STUDENT ADVISNG: The Office of Student Academic Affairs has planned a number of advising activities to help Letters and Science students as they select courses for the spring 1996 term.

The special advising period runs from Nov. 6 to Dec. 8, Timetables will be available in early November, and registration begins on Nov. 14. In South Hall, additional telephone and lobby access services will be available. There will be numerous workshops in South Hall focusing on degree requirements.

The Interim Multi-Cultural Center in Memorial Union and the Honors House in Sellery Hall will also offer advising workshops. Anyone with questions about Advising Period activities may contact a member of the Advising Period Committee at 262-2644.

Skills

WORKSHOPS - COMPUTER TRAINING

COMPUTER CONFERENCING IN EDUCATION: The DoIT Instructional Technology group is sponsoring a satellite broadcast "Computer Conferencing: Alternative to Lectures" presented by the Institute for Academic Technology.

In this broadcast, four different campuses will be visited and six faculty members will demonstrate the use of computer conferencing in a wide range of courses and with diverse student populations. How to incorporate computer-based conferencing into your own lecture-based courses will also be discussed.

Both teacher's and learner's points of view on issues such as motivation, student interaction, empowerment, and depth and understanding of subject matter through dialogue will also be examined, along with computer conferencing tools ranging from e-mail and screen capture software to more sophisticated applications such as FirstClass. The broadcast can be seen on Nov. 13, from noon to 1:30 p.m. in Union South (see Today in the Union) on cable channel 42.

Etc.

ANNOUNCEMENTS - OPPORTUNITIES

ESSAY CONTEST: Pi Lambda Phi is celebrating its hundredth year anniversary. To coincide with this celebration, the Wisconsin chapter is sponsoring an essay contest on the elimination of prejudice. There will be cash prizes for the top three entries as well as a booklet published with the top ten essays. The question to be answered is on the elimination of prejudice on campus. The deadline for entry will be Nov. 6. All questions should be directed to elimprej@macc.wisc.edu.

ART AUCTION: The sixth annual Art and Antiques Auction, sponsored by the Friends of UW Hospital and Clinics, will be held Nov. 4 at the Edgewater Hotel from 5-8 p.m. Featuring paintings, sculpture, furniture, jewelry and other items from the state's leading artists and galleries, the auction raises money for the UW Scholars Program. The program provides scholarships for undergraduates in the health sciences. Award-winning jewelry designer Paulette Werger is this year's featured artist. The silent auction will be at 5 p.m. and the voice auction begins at 6 p.m. Tickets are $20 in advance and $25 at the door. Call the UW Hospital and Clinics volunteer services office at 263-6046 for tickets and information.

WOMEN NEEDED: Waisman Center researchers are currently seeking pre- and post-menopausal women between the ages of 45-55 to participate in a clinical study on voice and speech characteristics. Participants should be in good general health, non-smokers, and not currently taking hormones. Participants will receive $25 for completing the 2 hour session as well as a free voice evaluation, a hormone level test and a hearing screening. If interested, please call Annie Ramos 263-5906 or email ramos@waisman.wisc.edu.

BOOK DAYS: Book Days at Borders Book Shop to be held on Nov. 10, 11 and 12th. Make a purchase at Borders Book Shop, 3416 University Ave, and say "I support the Waisman Early Childhood Program." The program will receive 15% of all sales, excluding food, when purchasers identify themselves as supporters. The Waisman Early Childhood Program is a model educational program at the UW-Madison's Waisman Center. The program serves young children who are typically developing as well as those with special education needs due to a developmental delay or disability.

DIAL MESSAGE OF THE WEEK:

Oct. 23: *#3119, Madison AIDS Support Network*
Oct. 30: *#1486, Stress Management*
Call DIAL, 263-3100
gopher://gopher.adp.wisc.edu:70/11/.browse/.METACACDI

DIAL help-line recorded messages, sponsored by the Campus Assistance Center, are accessible 24 hours a day by calling 263-3100 and entering the four-digit code of the message you wish to hear. By rotary phone, you can dial the CAC at 263-2400 and request the messages by number. Messages are available on WiscINFO, in the General Campus and Community Information folder.

WISCONSIN WEEK BREAK SCHEDULE: Due to Thanksgiving break, issue 16 of *Wisconsin Week* will be published Nov. 29 — three weeks after the Nov. 8 issue. The On Campus section for the Nov. 8 issue will cover Nov. 10-30.

DIGITAL

from page 12

create a Web page for the arts on campus.

• The Elvehjem Museum will digitize 50 selections from its print collections, testing color and other reproduction qualities and preparing for access to the museum's inventory via the World Wide Web.

• University Archives will prepare a Portfolio Photo CD of 100 popular photographs from the Aldo Leopold Collection. The photographs are in great demand both nationally and internationally.

• Mills Music Library will create a multimedia Web package commemorating the history of the American musical theater. The sound will consist of excerpts from contemporaneous performances of productions documented in the prominent Tams Witmark Collection.

"We are pleased to be able to partner with Kodak, an acknowledged industry leader which understands the university's commitment to preserve, apply and provide access to knowledge," says Kenneth Frazier, director of the General Library System.

Frazier and Mark Luker, director of the Division of Information Technology, are project directors for the campus. The GLS and DoIT are together providing project coordination and support.

"The collaboration across division and department lines within the university has been one of the most rewarding aspects of the Kodak project," Frazier says. "We feel that this is the type of cross fertilization that Chancellor David Ward has been communicating in his 'Vision for the Future' statements about future priorities for UW-Madison."

Tested will be Kodak's new Digital Enhancement Station 200. This system is a configuration of Create-It Photo Plus imaging enhancement software, XLS 8600 photographic quality thermal printer, Digital Print Scanner 1000, and PCD 225 CD Writer with Build-It Photo CD Portfolio Disc Production Software. Also tested will be the RFS 2035 film scanner, the DC40 digital camera, and the DCS 420 Professional Digital Camera. The equipment is located in the New Media Center in College Library.

— Deborah Reilly

POLLUTION

from page 1

model such pollutants as ozone, nitrogen, sulfur and volatile organic compounds.

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NEWS TIPS

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Phone: 608/262–3571
Fax: 608/262–2331

Office of News & Public Affairs
28 Bascom Hall • 500 Lincoln Drive
Madison, Wisconsin 53706–1380

July 12, 1995

TO: **Editors, news directors**
FROM: **Terry Devitt, (608) 262-8282**
RE: **Galileo Mission to Jupiter**

If all goes according to plan, tomorrow (July 13), a UW-Madison experiment will be one big step closer to the planet Jupiter.

The experiment, embodied in a device know as the Wisconsin Net Flux Radiometer, has been on route to Jupiter since 1989 aboard the $1.4 billion Galileo planetary probe.

Tomorrow, at approximately 12:30 a.m. CDT the Galileo spacecraft will jettison a small entry probe that contains the Net Flux Radiometer and five other experiments. After a 147-day journey, the entry probe will penetrate Jupiter's stormy atmosphere where it will take the first direct measurements of the Jovian atmosphere. Entering the atmosphere just north of Jupiter's equator at a speed of 105,000 miles per hour, the Net Flux Radiometer will descend 372 miles (part of the way by parachute) and transmit data back to the Galileo orbiter for relay back to scientists on Earth.

Among the many scientific objectives of Galileo mission to Jupiter are studies of the chemical composition and physical state of the Jovian atmosphere, and the rate at which radiation is heating and cooling different atmospheric layers and causing atmospheric motions. It is to those studies that the Net Flux Radiometer — designed to sample solar and thermal radiation — will contribute, according to Lawrence A. Sromovsky, a planetary scientist at UW-Madison's Space Science and Engineering Center. To date, scientists have painted a picture of Jupiter as a huge spinning ball of gas and liquid with an atmosphere that consists primarily of hydrogen and helium. It has at least three cloud levels where the clouds consist of different chemical compounds. This brief, 75-minute probe of Jupiter's atmosphere will give scientists their first peek beneath the clouds of the huge planet.

For more information or to arrange an interview, contact Sromovsky at (608) 263-6785.

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Space Science + Engineering Center

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Madison, Wisconsin 53706–1380

Dec. 18, 1995

TO: **Editors, news directors**
FROM: **Terry Devitt, (608) 262-8282**
RE: **Galileo Probe news conference**

The National Aeronautics and Space Administration (NASA) had scheduled a news conference for Tuesday (Dec. 19) at noon CST at which preliminary science results from the recent Galileo probe of Jupiter were to be released.

Larry Sromovsky, a scientist at UW-Madison's Space Science and Engineering Center and the principal investigator for the Net Flux Radiometer, one of the instruments aboard the probe, was scheduled to take part. However, because of the budget impasse and the shutdown of the federal government, the official NASA news conference may be canceled. An "unofficial" news conference, one not supported by NASA personnel or that would feature key NASA scientists, may be held in its place.

Should the official news conference take place as scheduled, it will be broadcast live on NASA TV from NASA's Ames Research Center at Moffett Field, California. The space agency's satellite television network can be accessed through the following coordinates:

GTE Spacenet 2
Transponder 5 (channel 9)
Frequency: 3880 MHz
Orbital Position: 69 degrees West Longitude
Audio: 6.8 MHz

Any media without direct access to a satellite dish are welcome to view the news conference in the 3rd Floor Conference Room (Room 351) of UW-Madison's Atmospheric, Oceanic and Space Science building on the corner of Orchard and Dayton streets. The contact at UW-Madison's Space Science and Engineering Center is Terri Gregory. She can be reached at (608) 263-3373 if you have questions about parking or other aspects of the event. The Public Affairs contact at NASA's Ames Research Center is Ann Hutchison, (415) 604-4968.

Should details of an "unofficial" news conference be made available, we will pass those along as soon as we receive them. Should any unofficial news conference be held, it will NOT be broadcast over NASA TV.

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NEWS TIPS

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Phone: 608/262–3571
Fax: 608/262–2331

July 29, 1994

TO: **Editors, news directors**
FROM: **Brian Mattmiller, (608) 262-9772**
RE: **Summer workshop in atmospheric science**

A group of talented Wisconsin high school students and science teachers visiting the university next week will be in for some nasty weather.

More than two dozen students and science teachers will visit UW-Madison's Space Science and Engineering Center (SSEC) Aug. 2-4 for an in-depth workshop on space, earth and atmospheric science. While here, they will get presentations on the hard science of geology and geophysics, a primer on land remote sensing and satellite technology, and finally a chance to put that knowledge to work.

The highlight of the visit will be hands-on work with McIDAS, shorthand for Man-computer Interactive Data Access System. McIDAS is the nerve center for literally billions of bits of real-time satellite data on the weather, all translated and presented visually through computers.

Students will be given a region of the world to study for a day, then come up with weather forecasts for the next day. They will also develop forecasts for their home towns. For fun, they'll also have a chance to view "McIDAS' Greatest Hits," a collection of spectacular satellite images of past hurricanes, thunderstorms, volcanoes, the Kuwaiti oil fires and nearby planets.

"Working with McIDAS is like having a blank canvas, where you can just start creating things," said Thomas Achtor, an SSEC program manager and coordinator of the third annual workshop. "That's what we consider the most powerful part of having McIDAS in the school system, that total interactivity."

Achtor will work with the 10 science teachers attending the workshop on integrating McIDAS into the curriculum. Any school with access to the Internet can tap into some of the McIDAS information. Teachers from Madison, Milwaukee, Racine, Whitewater, Watertown, and other cities will attend.

The workshop is funded by a grant from NASA. Achtor said it is part of a wave of outreach activity by groups across the U.S. to use exciting technology like McIDAS in teaching the physical sciences.

(Editor's note: Media visits would be best on Tuesday afternoon. At 1:30 p.m., the group will observe the launch of a weather balloon from the SSEC rooftop, followed by an introduction to McIDAS. To arrange a visit, contact Achtor at (608) 263-4206, or the center's public relations specialist, Terri Gregory, at (608) 263-3373.)

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Space Science + Engineering Center

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Phone: 608/262–3571
Fax: 608/262–2331

April 12, 1994

TO: **Editors, news directors**
FROM: **Terry Devitt (608) 262-8282**
RE: **GOES I Launch**

If all goes well in the early morning hours of Wednesday (April 13), NASA will launch a weather satellite known as GOES I into geostationary orbit above the United States. The satellite will boost weather satellite coverage of the United States and provide weather forecasters with an indispensable tool for making predictions and for monitoring severe storms such as hurricanes and tornadoes. Scientists at UW-Madison's Space Science and Engineering Center (SSEC) helped design instruments aboard the satellite and developed the complex software codes that enable it to obtain and process weather information. SSEC also serves as the national archive for pictures and other data obtained from weather satellites.

The first weather satellite — the progenitor of all weather satellites since — was invented in the 1960s by Verner Suomi, an emeritus professor at UW-Madison and the founder of the Space Science and Engineering Center here. Suomi also invented the computer systems that enable atmospheric scientists and others to manipulate and display the weather images beamed to earth from space.

The contact here is Christopher Hayden, who directs the local branch of the National Environmental Satellite and Data Information Service, an arm of the National Oceanic and Atmospheric Administration, the federal agency in charge of the new satellite's development. Hayden can be reached at (608) 264-5325. For further assistance and for help obtaining satellite imagery for use by TV reporters, contact Terri Gregory at (608) 263-3373.

If you have any questions, feel free to call me. Thanks!

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Space Science + Engineering Center

NEWS TIPS

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UNIVERSITY OF WISCONSIN–MADISON
News & Information Service
19 Bascom Hall • 500 Lincoln Drive
Madison, Wisconsin 53706–1380

Phone: 608/262–3571
Fax: 608/262–2331

Aug. 30, 1993

TO: **Editors, news directors**
FROM: **Terry Devitt (608) 262-8282**
RE: **Hurricane Emily**

Scientists at UW-Madison's Space Science and Engineering Center, one of the nation's premier meteorological satellite research centers, are using new satellite and computer capabilities to keep tabs on Hurricane Emily.

Using Meteosat, a European geostationary satellite positioned over the West Atlantic Ocean, UW-Madison researchers are employing images of atmospheric water vapor to help predict the path of Emily, now forecast to strike the Southeastern coast of the United States sometime tomorrow (Aug. 31). The experimental technique gives scientists a look at the high-altitude atmospheric currents that steer large weather systems like hurricanes. If successful, the new method could become a powerful new observation and analysis tool for scientists at the National Hurricane Center in Miami and the National Meteorological Center in Washington, D.C.

Christopher S. Velden, a UW-Madison scientist, is leading the effort. He can be reached today and tomorrow at (608) 262-9168.

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Space Sci + Engineering

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NEWS
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News & Information Service
19 Bascom Hall • 500 Lincoln Drive
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FOR IMMEDIATE RELEASE 1/18/93

CONTACT: Wilton T. Sanders, (301) 286-2145, (608) 263-6753

NASA-WISCONSIN SHUTTLE EXPERIMENT LINKS X-RAYS TO SUPERNOVA

GREENBELT, Md. — Astrophysicists, analyzing preliminary data from a NASA-University of Wisconsin-Madison X-ray spectrometer aboard the Space Shuttle Endeavour, have obtained the first direct evidence that mysterious X-rays from deep space emanate from vast clouds of invisible gas.

The clouds of ionized, extremely hot gas, many scientists believe, were produced long ago by cataclysmic supernova explosions.

Using a detector known as the Diffuse X-ray Spectrometer, or DXS, astrophysicists from the University of Wisconsin-Madison sampled faint X-rays that appear to be a signal from a supernova event that occurred in the vicinity of our solar system.

Since the beginning of X-ray astronomy in the early 1960s, scientists have puzzled over the origins of the low-energy X-rays that emanate from seemingly empty space, including a huge region around our solar system.

If scientists' ideas of how these enormous pockets of superheated gas came to be is correct, then the X-ray signal detected by DXS may be coming from gas heated by the blast wave of a supernova, according to Wilton T. Sanders, a UW-Madison astrophysicist.

That supernova, which occurred about 300,000 years ago, likely created a

-more-

pulsating star known as Geminga as well as an expanding pocket of superhot X-ray-emitting gas that now surrounds our solar system and extends for several hundred light years in all directions.

Recently, observations from the German-American X-ray satellite ROSAT and NASA's Compton Gamma Ray Observatory identified Geminga as a pulsar, a very dense, rapidly rotating species of star associated with supernova events.

"What we are seeing is like an echo from the past," said Sanders, principal investigator for DXS. "For 30 years, scientists have speculated about the origins of these X-rays and now this echo, these faint X-rays that we're looking at, are starting to give us some answers."

The X-rays being deciphered by the Wisconsin scientists seem to underpin a theory put forward 20 years ago by UW-Madison scientist that the X-rays are produced in vast clouds of superhot, ionized gas heated by supernova explosions in our galaxy.

"We're looking at objects that are so hot they glow in X-rays," Sanders said. "They're hotter that white hot, they're hotter than blue hot. They're X-ray hot and that means that the temperatures of these clouds is something on the order of a million degrees."

In addition to scanning the sky in the direction of Geminga, the DXS detectors — a pair of extremely sensitive X-ray spectrometers mounted on opposite sides of Endeavour's cargo bay--swept other regions of space. There they detected X-rays whose signature looks distinctly different from that of Geminga, and could possibly be from a far older supernova event.

That supernova, which probably occurred millions of years ago, created a similar

gas bubble that is now much bigger than the one that may have been caused by Geminga.

"So what we may be seeing with Geminga is the creation of a gas bubble within a gas bubble," Sanders said. "The effect of Geminga would be to reheat and, if it exploded near the edge of this region, enlarge the existing cavity in one direction."

Sanders cautioned that while the DXS data look good, they are still preliminary and will require extensive analysis before they can be presented to the scientific community.

High counts of high-energy particles initially led to some problems with the DXS instrument early in the flight of STS-54, which was launched from the Kennedy Space Center, Cape Canaveral, Fla., on Jan. 13.

However, by purging the detectors with gas and heating them, ground controllers at the Goddard Space Flight Center (GSFC), Greenbelt, Md., were able to return the instruments to operation. GSFC manages the DXS for NASA's Office of Space Science and Applications.

###

— Terry Devitt, (608) 262-8282

X-Ray

SPACE SCIENCE AND ENGINEERING CENTER

UNIVERSITY of WISCONSIN - MADISON
1225 West Dayton Street
Madison, Wisconsin 53706

April 5, 1990

Contact: Terri Gregory, 608/263-3373

Current Spaceflight Hardware Development and Studies at SSEC

X-ray Astronomy
The Diffuse X-ray Spectrometer (DXS), designed and built by SSEC technical and scientific crew for physicist William Kraushaar, is in the final readiness stages before shipment to NASA's Goddard Space Flight Center. The DXS is scheduled for delivery in late May, preparatory for a 1991 launch aboard the Space Shuttle. The two detectors of the DXS will be used to map low energy x-rays from certain regions of the sky. These x-rays emanate from the hot (about one million degrees) plasma within the interstellar medium.

A proposed four-detector version of the DXS, called the X-ray Background Survey Spectrometer, has been accepted for Space Station Freedom. SSEC astrophysicist Wilton Sanders is principal investigator.

Space Telescope Scientific Studies
Sanjay Limaye, of SSEC, is the University of Wisconsin's single scientist on the scientific observing team for the Hubble Space Telescope's Wide-Field Planetary camera. Limaye will study the atmospheres of Jupiter, Saturn and Titan. He joins scientists at New Mexico State University, the State University of New York, the University of Texas, NASA's Jet Propulsion Laboratory and Goddard Institute for Space Studies.

Cassini Instruments
NASA has funded studies for two experiments that may fly on the 1996 Cassini mission to Saturn and its moon Titan. An SSEC group with Professor John Anderson and scientist Lawrence Sromovsky is developing a radar to measure Titan's winds and the depth of its ice layer. The radar will also measure the probe's altitude during its descent. SSEC scientist Sanjay Limaye heads a team to design a Thermal Solar Radiometer to measure radiant energy in Titan's atmosphere. This instrument is a version of the Galileo net-flux radiometer. Cassini will reach Saturn in 2003.

Galileo
Since the Jupiter-bound Galileo mission was successfully launched in October 1989, it has flown past Venus and is on its way back to Earth in December for an assist to the asteroid belt. If all goes as planned, it will be the first spacecraft to view an asteroid. After a second Earth fly-by in December 1992, a second asteroid will be viewed in August 1993 as the spacecraft whizzes past to Jupiter. NASA's Jet Propulsion Laboratory will be first to get pictures of all these encounters, but SSEC will also receive them, including a month-long Earth/moon movie this July and August. Of special importance to SSEC scientists though is the Galileo probe's descent through Jupiter's atmosphere, when the experiment built here does its work. That's the Net Flux Radiometer Experiment which measures changes in radiation received and sent out as the probe descends. Scientists Lawrence Sromovsky, Hank Revercomb, Sanjay Limaye and the whole design team will be ready after their long wait to analyze the instrument's data on Jupiter's atmospheric changes.

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Fact Sheet
University of Wisconsin-Madison
Space Science and Engineering Center
Galileo Net Flux Radiometer

Space Science & Engineering Center

The Project: Galileo is a planetary probe destined for the planet Jupiter. After a six year voyage to the planet, it will enable scientists to study at close range the planet and some of its 15 known moons. There are two important components of the Galileo spacecraft: an orbiter and an instrumented probe that will be jettisoned by the orbiter and that will descend to the planet to obtain the first direct measurements ever of Jupiter.

The Launch: The launch of Galileo aboard the space shuttle for the first stage of its long voyage to Jupiter is now scheduled for Oct. 12. The launch will occur at the Kennedy Space Center at Cape Canaveral, Fla. Although the date could change, there is only a brief launch window of about 45 days. Any setback from that window would mean a wait of up to 19 months before the planets are again in their proper alignments.

The Planet: Jupiter is the largest planet in the solar system and the fifth in distance from the sun. It has 15 known moons. The planet itself resembles a huge ball of spinning gas and liquid. Jupiter is believed to have at least three cloud levels in its atmosphere, each level having clouds made primarily of different chemical constituents. The lowest level has clouds consisting of water, the next has clouds of ammonium hydrosulfide, and the highest has clouds of ammonia. The surface of the planet is not well defined, but below the atmosphere it is envisioned that the planet is principally liquid hydrogen and helium. The planet has many interesting weather features including one, the Great Red Spot, that is a hurricane-like feature of massive proportions -- about three times the size of the Earth itself -- and that has been known to exist for at least 300 years.

The UW-Madison Role: Aboard Galileo's entry probe is a device called the Net Flux Radiometer. Developed in part by UW-Madison scientists, the Net Flux Radiometer is designed to sample the thermal and solar radiation of the planet as the probe it's attached to descends through the deep Jovian atmosphere. This device will be among the first ever to take direct measurements of the planet. The UW-Madison experiment will also measure water vapor and cloud structure.

The UW-Madison Players: Most of the work done on the Net Flux Radiometer has been conducted at the UW-Madison Space Science and Engineering Center. Wisconsin experiment team members include Lawrence A. Sromovsky, Henry Revercomb, Fred Best, Patrick Fry, Donald Thielman and Jeff Vian. Other work involving the Net Flux Radiometer has been done at the University of Arizona and at NASA's Ames Research Center.

October 1989
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uw news

From the University of Wisconsin-Madison / News Service, Bascom Hall, 500 Lincoln Drive, Madison 53706 / Telephone: 608/262-3571

Release: Immediately 7/26/88

CONTACT: Verner E. Suomi (608) 262-6172, Francis P. Bretherton (608) 262-7497

SUOMI TO TURN OVER REINS OF UW-MADISON SPACE CENTER

MADISON--Verner E. Suomi, the pioneering space scientist and meteorologist, said Tuesday (July 26) he will step down as director of the University of Wisconsin-Madison's Space Science and Engineering Center (SSEC).

Suomi, 72, co-founded the center in 1965 with late UW-Madison electrical engineer Robert Parent. Suomi will turn over the center reins to Francis P. Bretherton, internationally acclaimed meteorologist and former director of the National Center for Atmospheric Research (NCAR) in Boulder, Colo.

Suomi has been the only director of the space center, which specializes in studies of the atmospheres of Earth and the planets, the construction of satellite hardware and other spaceflight instruments, and the development of powerful computing and imaging tools for meteorologists and space scientists.

SSEC was started in 1965 with $500,000 in seed money from NASA, and was built by Suomi and others into a research center employing 190 people and attracting visiting scholars from around the world.

In fiscal 1987, SSEC received more than $10 million in research support from the federal government, industry and foreign sponsors of research.

Instruments and sensors conceived and built by Suomi and his SSEC team have flown countless hours in space and provided researchers with a wealth of information about Earth's atmosphere and oceans. SSEC has also developed devices to probe the atmospheres of the planets Venus and Jupiter.

-more-

Add 1--Suomi

Suomi is perhaps best known for his invention of the spin-scan camera, a satellite-borne scanning camera able to take moving pictures of an entire hemisphere; and for his development of McIDAS, a powerful interactive computer system that allows researchers and forecasters to manipulate satellite images and other information much as television sportscasters use instant replays.

Under Suomi, the SSEC also has become a fertile proving ground for the scores of meteorology, engineering and physics students. As an emeritus professor, Suomi plans to continue his research and stay active at the center.

Suomi's many honors include the National Medal of Science, presented by President Jimmy Carter in 1977; and the Franklin Medal, an award presented in the past to the likes of Thomas Edison, Orville Wright and Albert Einstein.

"They call me the father of satellites," Suomi said, "but the mother is equally important, and the mother of all that we've done at SSEC is everybody who has contributed over the years. The reason this place is so good is because of the people who work here, not because of me."

Suomi's successor, Francis Patton Bretherton, 53, is a senior scientist at NCAR. He will assume the directorship of SSEC in late August.

Bretherton was director of NCAR from 1974-1980 and president of the University Corporation for Atmospheric Research in Boulder from 1973-1980. From 1969-1974 he was a professor in earth and planetary sciences at Johns Hopkins University and chief scientist at the Chesapeake Bay Institute.

Educated at Cambridge University, Bretherton has authored or contributed to more than 60 scientific papers. He has served on the National Academy of Sciences' Committee for the Global Atmospheric Research Program, the National Academy of Sciences' Space Science Board, NASA's Earth Systems Sciences Committee, and the World Climate Research Program.

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-- Terry Devitt (608) 262-8282

Space Science Ctr
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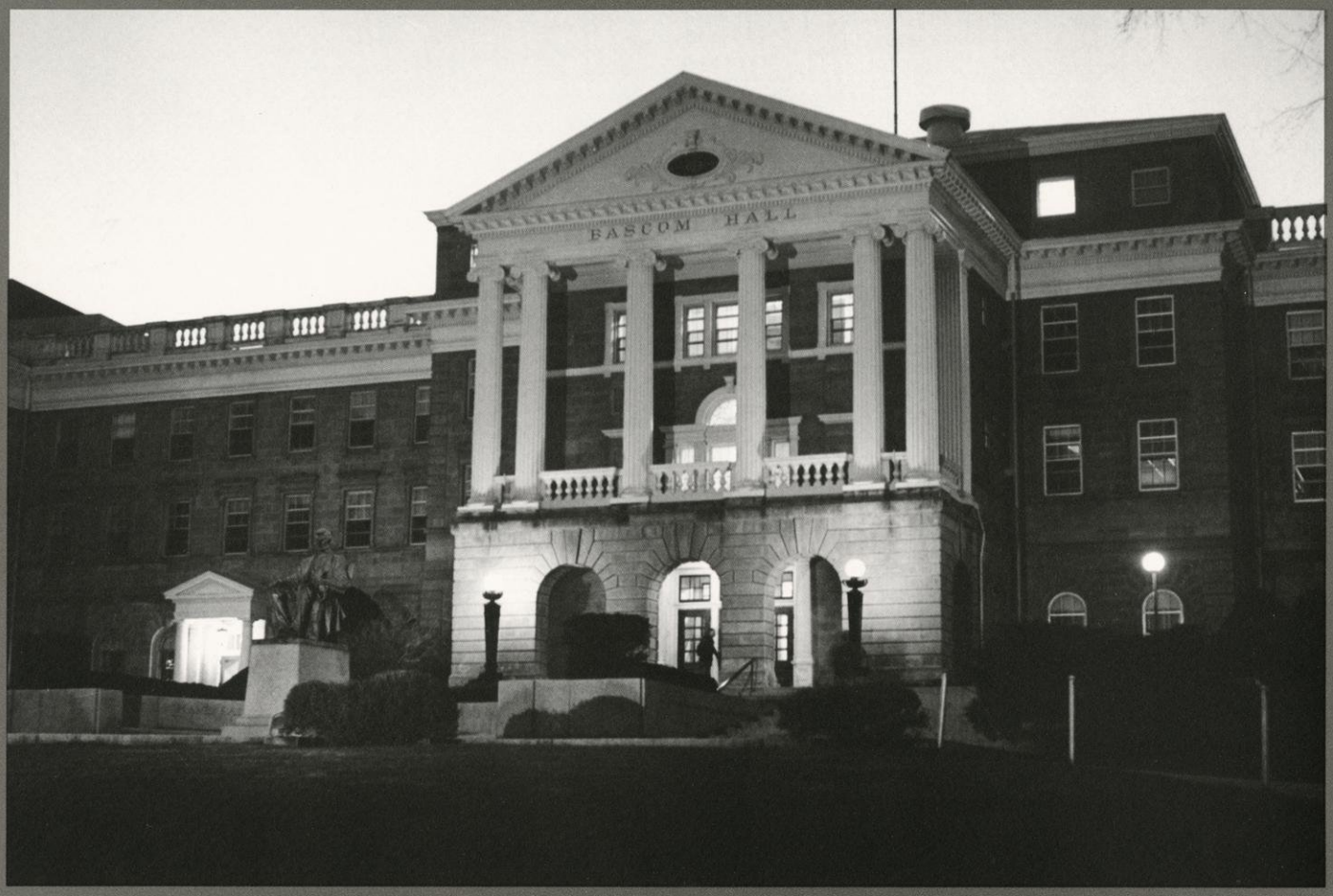
APPLICATION BRIEF

IBM
ACADEMIC
INFORMATION
SYSTEMS

University of Wisconsin–Madison

Space Science and Engineering Center Uses IBM Computers to Enhance Atmospheric Research and Forecasting



The University of Wisconsin-Madison, a public land-grant institution founded in 1849, combines nine schools and three colleges on a 900-acre campus along the shores of Lake Mendota, one mile from the state capitol.

A faculty of 2,400 and a professional staff of 3,500 provide educational opportunities to more than 45,000 students in 133 academic departments at the Madison campus.

In a 1984 National Science Foundation survey, UW-Madison ranked third among the nation's higher education institutions in total expenditures for research and development.

The Space Science and Engineering Center (SSEC) for multidisciplinary research and development was established in 1966 as part of the UW-Madison Graduate School. SSEC's mission encompasses atmospheric studies of the earth and other planets, interactive computing, data access and image processing, and space flight hardware development and fabrication.

The Man-computer Interactive Data Access System (McIDAS), in development since 1972 at the University of Wisconsin-Madison Space Sciences and Engineering Center (SSEC), manages and analyzes data used for meteorological research and operational weather forecasting.

Weather data received through dish antennas from the Geostationary Operational Environmental Satellite (GOES) are analyzed, processed, and archived by McIDAS' IBM 4381 Mod 3 mainframe computer. SSEC scientists and programmers are developing IBM PC/ATs as workstations to improve data accessibility, ease operational use, and increase the commercial applications of McIDAS.

The SSEC staff is applying the image processing capabilities of McIDAS to new applications beyond atmospheric research in planetary studies, radiology, and biochemistry.

Behind the desk of Irving Shain, Chancellor of the University of Wisconsin-Madison, hangs the first picture ever taken of earth from a geostationary weather satellite. "That was the first visual proof that the earth was really round," explains Shain, "and it was taken November 18, 1966 with a spin-scan camera designed by a member of the meteorology faculty for SSEC."

The Meteorology Department at UW-Madison is the largest in the nation and is highly regarded, says Shain. The department was among the first in the nation to recognize that using computers to process data from space satellites for weather prediction would become a key technological development for the meteorologist.

IRVING SHAIN IS CHANCELLOR OF THE UNIVERSITY OF WISCONSIN-MADISON.

McIDAS Sorts Out the Data Deluge

Much of the initiative to move toward computers for processing meteorological data came from Verner E. Suomi, Professor Emeritus of Meteorology, twice chairman of the Meteorology Department, and present director and co-founder of SSEC. Suomi's spin-scan camera invention made it possible to measure atmospheric phenomena at frequent intervals by gathering more data.

"But we need information, not data," Suomi argues. "Our task is to gain information from this data in near real time. It is like drinking from a fire hydrant—thanks to the computer we can do it without drowning!

"Once scientists could place weather images in the computer," adds Suomi, "they could process it to see clouds moving. Cloud temperatures reveal cloud altitudes, and with new satellite instruments to measure the temperature of the air, we can construct the temperature structure of the atmosphere quite well. This becomes part of the large-scale mathematical modeling which is necessary to make a forecast."

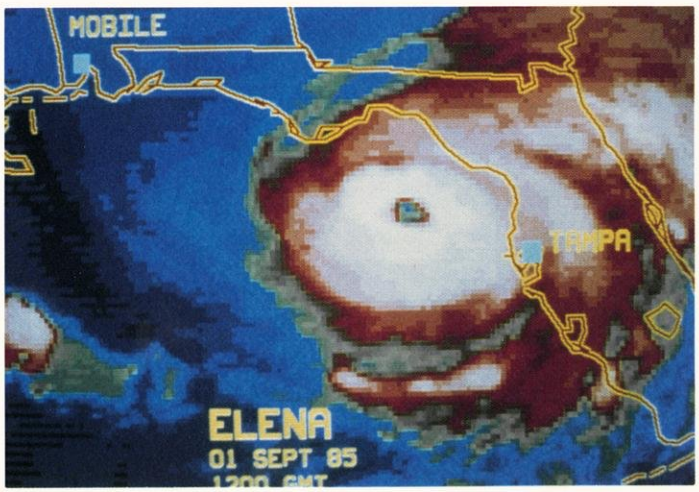
Meteorologists must sort through a wide range of data types, gathered at various times and with varying spatial resolutions. A tornado is relatively confined in time and space compared to the scale of a hurricane.

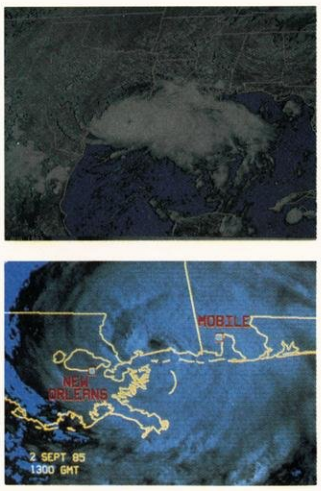
VERNER E. SUOMI, PROFESSOR EMERITUS OF METEOROLOGY, IS THE DIRECTOR AND CO-FOUNDER OF THE UNIVERSITY OF WISCONSIN-MADISON SPACE SCIENCE AND ENGINEERING CENTER.

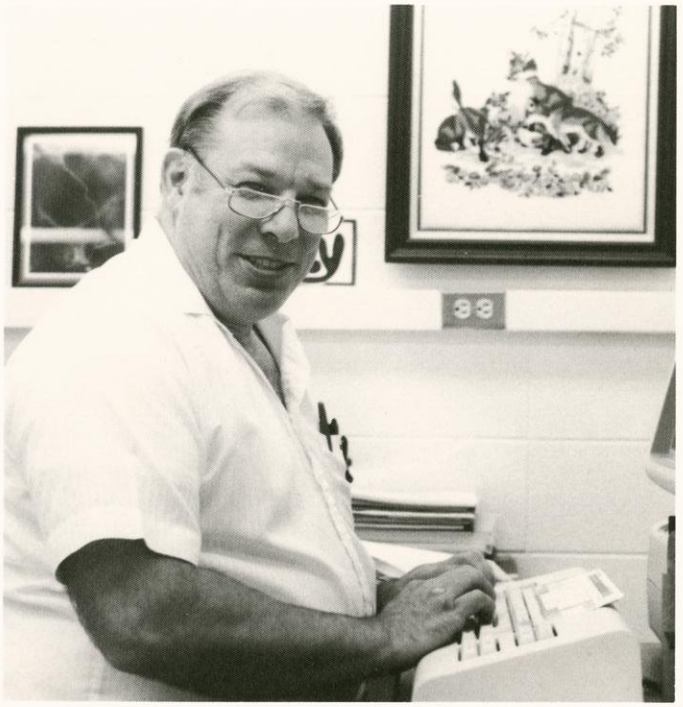
"Simply accessing data in the right scale is a big job," says Suomi. "What we have developed with the Man-computer Interactive Data Access System (McIDAS) is a way to make use of the tremendous amount of data streaming down from GOES.

Almost as important as predicting weather is the ability to display weather. McIDAS tracked hurricane Elena during the 1985 Labor Day weekend. "This visualization of the storm—so that people could see this roaring monster—was very valuable to Neal Frank, head of the National Hurricane Center, in his public effort to get people to move away from the beaches," recalls Suomi.

HURRICANE ELENA, AN UNWANTED 1985 LABOR DAY WEEKEND VISITOR IN THE GULF OF MEXICO, WAS TRACKED BY McIDAS AS IT MOVED FROM OFF THE FLORIDA COAST TO THREATEN NEW ORLEANS. COMPUTER-GENERATED COLOR ENHANCEMENTS GIVE METEOROLOGISTS MORE INFORMATION ABOUT THE STRUCTURES OF SUCH SEVERE STORMS.







ROBERT J. FOX, EXECUTIVE DIRECTOR OF SSEC, ADMINISTERS THE WEATHER DATA ACCESS SYSTEM KNOWN AS McIDAS, ONE OF SIX INTEREST CENTERS THAT MAKE UP THE SSEC ORGANIZATION.

Worldwide Application

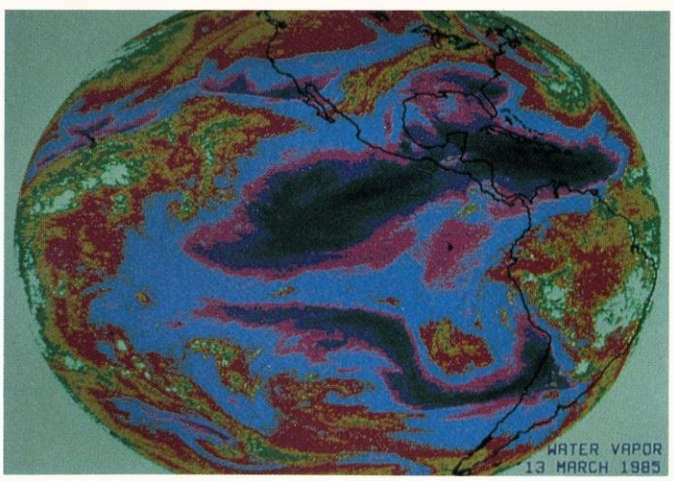
In addition to becoming a valuable tool for the National Hurricane Center in Miami, interest in McIDAS is spreading and varients of the system have been installed throughout the world.

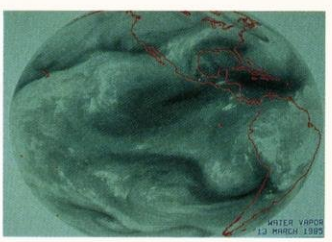
Robert J. Fox, Executive Director of SSEC, says McIDAS has been installed at Cape Kennedy and other major weather processing centers, including the National Meteorological Center in Washington, D.C., and the National Severe Storms Forecasting Center in Kansas City. "In addition, we have installed systems in China, Australia, Germany, and Spain, and continue to talk to other potential U.S. and international users."

Pursuing research grants and contracts is a constant process at SSEC, notes Fox. SSEC is a research center organized on the research side of the Graduate School of UW-Madison, which derives its funding support from research grants and contracts. SSEC's projects support the research activities of graduate students enrolled in degree-granting programs, though the SSEC itself does not grant degrees nor offer educational programs.

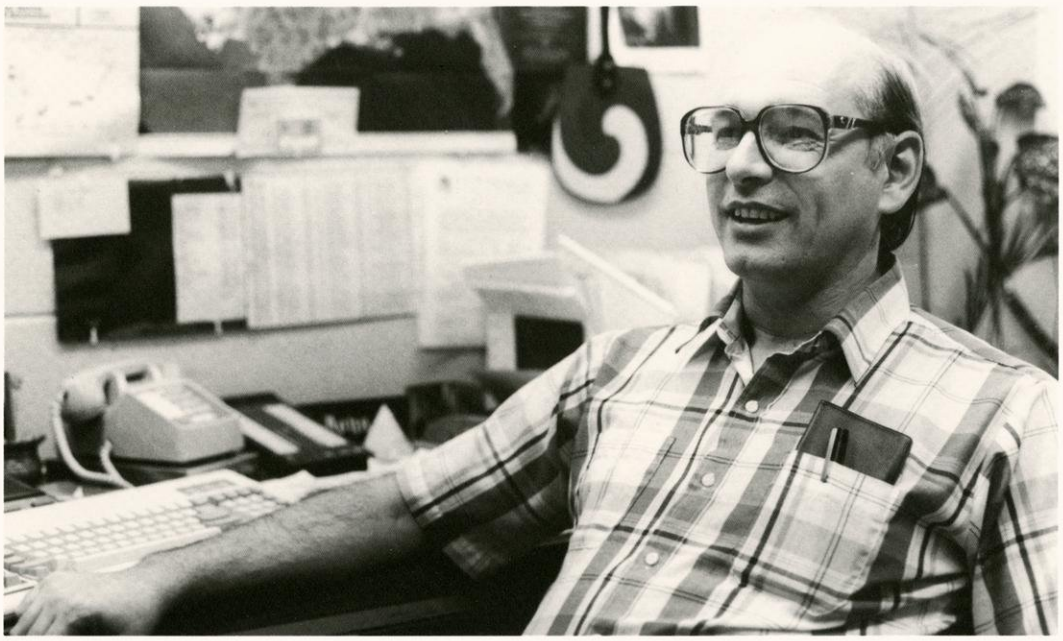
"SSEC provides jobs for students in research and development," says Fox. Federal agencies are the principal supporters of SSEC, which employs 167 graduate students and regular staff members as well as 47 undergraduate students.

"We are not a monolithic center with defined goals or a five-year plan," says Fox. "Rather, SSEC is a grouping of six interest centers which collectively guide our direction. We exist for the synergism that results from the pooling of our talents. McIDAS is one of these centers coordinated by John T. Young."





TWO GLOBAL WATER VAPOR IMAGES: ON THE LEFT WITH CONTINENTAL BOUNDARIES ADDED AND ON THE FAR LEFT WITH COLOR ENHANCEMENT AND CONTINENTAL BOUNDARIES.



JOHN T. YOUNG COORDINATES THE EXPANSION OF IMAGE PROCESSING AND OTHER McIDAS CAPABILITIES.

Image Processing and More With McIDAS

As McIDAS Coordinator, John T. Young views McIDAS as much more than a sophisticated interactive video tool to process meteorological data. Though designed to ingest large amounts of satellite and conventional weather data, and to generate two- and three-dimensional, multicolor, composite weather images with time-lapse sequencing, McIDAS is also a vast resource of image processing and applications programs and subroutines.

"Since we started developing McIDAS in 1972—following a bottom-up design concept—it has constantly evolved," says Young. "The software code exceeds 1.7 million lines. We have built a library of analysis tools with over 600 commands which have been used beyond meteorology to produce court evidence in murder and bank robbery cases, and to support research in qualitative and quantitative analysis of proteins."

Currently, McIDAS' IBM 4381 Mod 3 mainframe computer supports 70 workstations, ten of which exist outside the SSEC.

To open up space on the mainframe and to reduce communications expenses, Young anticipates microcomputers will increasingly process McIDAS data locally. "We need to replace terminals with IBM PC/AT workstations, which will access the mainframe only when new data is needed.

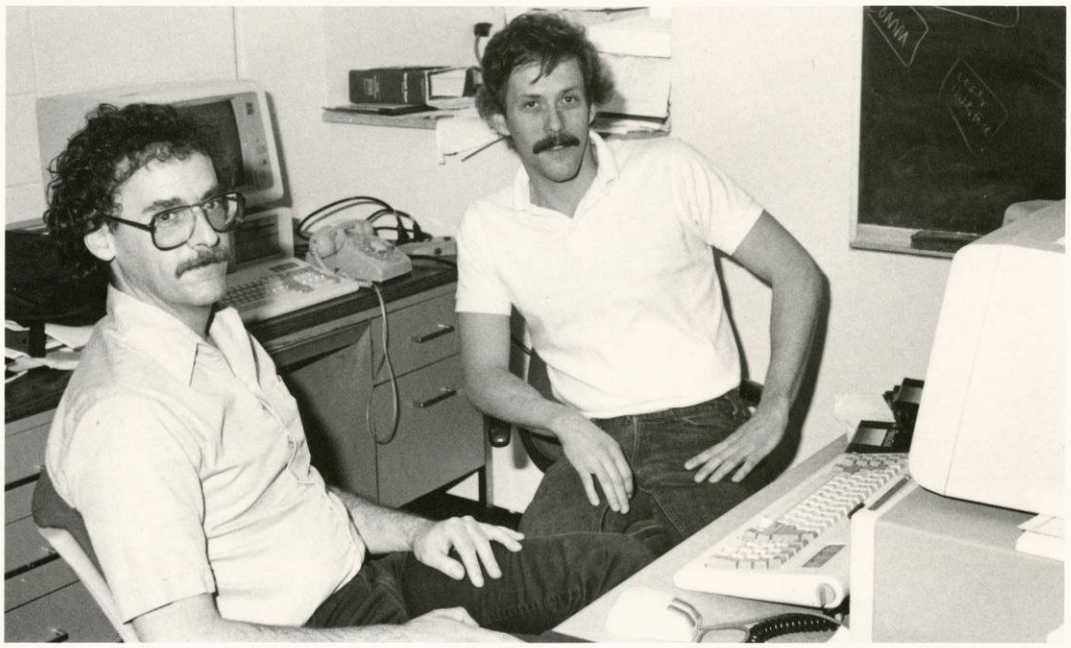
Another benefit of an IBM PC/AT workstation is increased versatility for the user, notes Young. "We are generalizing the software so that the IBM PC/AT can drive a variety of display devices. Beforehand, any McIDAS workstation necessitated a $100,000 investment. As a result of our microcomputer software development work, users may acquire adequate workstations for less than $10,000."

Voice-Recognition, 3-D Weather, and More

"Some of our more sophisticated projects are aimed at developing software for the IBM PC/AT to display McIDAS imagery. Any individual can then access McIDAS from their homes," explains Young. "McIDAS may then become a powerful tool for education and for private industry."

"We are also adding a 3,000-word voice recognition interface in support of space shuttle operations at Cape Kennedy," explains Young. "We plan to tap the communication channel on which operators talk to the astronauts to activate an IBM PC/AT to execute the commands we want."

Meteorologists, according to Young, typically cover walls with charts to help them mentally construct three-



TOM WHITTAKER (LEFT) AND JOHN IDE, RESEARCH SPECIALISTS, ARE GROOMING THE IBM PC/AT FOR FUTURE APPLICATION AS A HIGH-FUNCTION McIDAS WORKSTATION CAPABLE OF UNDERTAKING MANY TASKS NOW HANDLED BY THE MAINFRAME COMPUTER.

dimensional images of the atmosphere. With a contract from the NASA Marshall Space Flight Center, SSEC intends to produce three-dimensional images of the atmosphere using radar and current satellite and conventional data.

"The goal is to cross-polarize two overhead projectors, like they do to produce 3-D movies, and fill an entire wall with the current weather," explains Young. "Using joy sticks at their work stations, meteorologists then will be able to maneuver through the atmosphere."

Young also plans to provide meteorologists with a six-dimensional pointing device—a ring a user places on a finger which will pass to the IBM PC/AT McIDAS workstation its exact location to the nearest millimeter inside a 2-meter cube. The device will also give the yaw, pitch, and roll to a half degree so that the microcomputer will know exactly where the user is pointing.

"With voice interface, a pointing device, and a three-dimensional atmospheric display in front of the meteorologist, the user may point and say, 'I want to go there, stop, turn, and look this way' and have the whole atmospheric display respond to the orientation of the six-dimensional pointing device," notes Young. "The IBM PC/AT opened many opportunities for us. It is a way to escape being keyboard-bound."

Workstations Are More Versatile Than Terminals

Software specialists Tom Whittaker and Jon Ide are developing future McIDAS workstations using IBM PC/ATs. They want to move to the user site some of the functions now handled by the mainframe, "because 90 people are now sharing that resource," says Whittaker.

Ide and Whittaker, who intend to emulate mainframe McIDAS architecture on the IBM PC/AT, anticipate that the microcomputer will ultimately handle many mainframe applications. They intend that the IBM PC/AT will use the same applications software to support a variety of video displays to accommodate wider use.

"You can do many more things with an IBM PC/AT-based terminal because it gives you local computing power," adds Ide. "The mainframe will eventually distribute data which the workstation will manipulate locally. The advantages for McIDAS are enormous because, without an intensely interactive connection, the mainframe could then support more users."

Evolving to a data broadcast mode with remote processing represents a major extension to system philosophy, according to Whittaker, yet one that will not stray from McIDAS' original intent of being a tool for users. "Our philosophy has been to provide tools to the

research scientist. More recently, with our Kansas City installation at the National Severe Storms Forecast Center, we are expanding this to encompass operational needs as well," notes Whittaker.

The tools being developed for meteorologists will be simpler and more convenient to use. "Operational users want to strike a key and get a result. Unlike researchers, they don't necessarily want to know that they can specify many parameters... We expect and want McIDAS to grow," comments Ide. "We are always allowing for evolution."

Microcomputer Access to Satellite Data

William L.Smith, Professor of Meteorology, heads the Cooperative Institute For Meteorological Satellite Studies, a joint effort between the National Oceanic and Atmospheric Administration (NOAA) and UW-Madison and located in the SSEC. The 20 scientists involved with the institute focus on severe storm forecasting and satellite-based climate studies.

"We design instruments for space, process data from those instruments, analyze the data, and make experimental forecasts," says Smith.

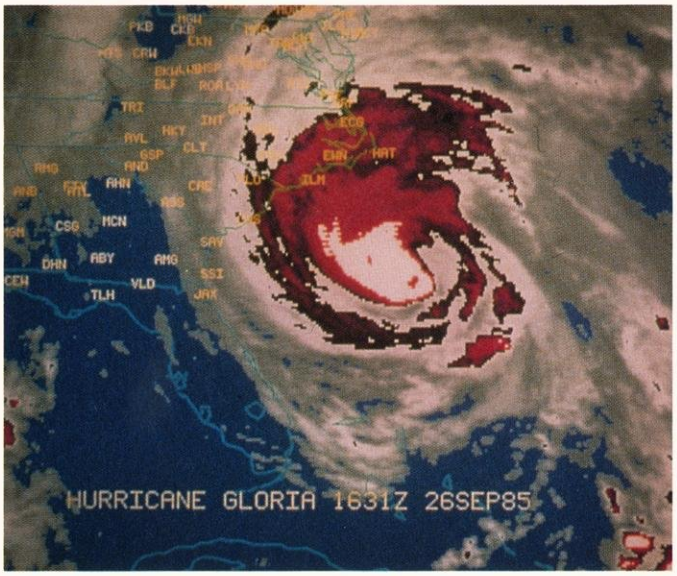
Because the tools being developed by Smith's group are being transferred to the nation's operational weather centers, he maintains a close relationship with them. "Our emphasis is on satellite data because we are trying to forecast local weather; i.e., the umbrella forecast," says Smith. "The satellite is the only tool right now which can provide weather observations closely spaced in terms of time and distance."

Smith's group has developed METPAK (Meteorological Package) for the IBM PC/XT and IBM PC/AT. With this software, users can access the McIDAS database at very low cost using microcomputers as terminal emulators, or in a dial-access mode.

"In the dial-access mode, images prepared every hour may be downloaded, though the users have little input in selecting images or how they are prepared," says Smith. "I envision the weather service offering a prepared product which anyone can access and display on a microcomputer in their home."

WILLIAM L. SMITH, PROFESSOR OF METEOROLOGY, HEADS THE COOPERATIVE INSTITUTE FOR METEOROLOGICAL SATELLITE STUDIES, WHICH FOCUSES ON SEVERE STORM FORECASTING AND SATELLITE-BASED CLIMATE STUDIES.

HURRICANE GLORIA ON ITS SEPTEMBER 1985 RUN UP THE EAST COAST, AS SEEN BY THE GOES SATELLITE, ON McIDAS.



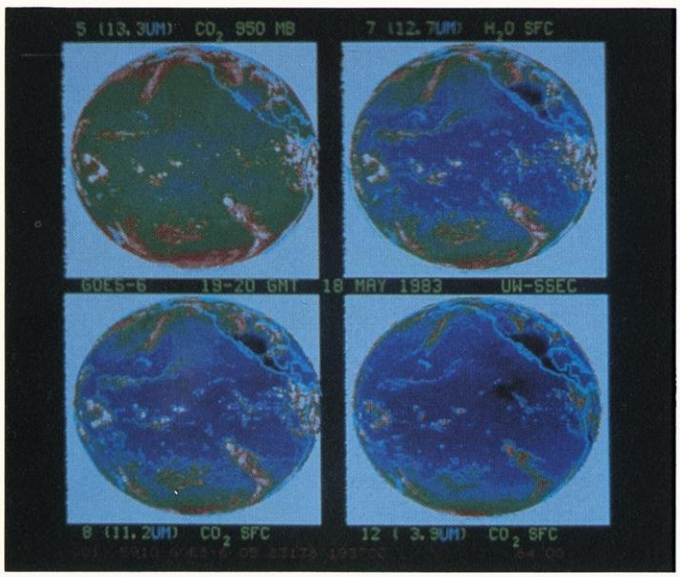
ANTHONY SIEBERS, A NATIONAL WEATHER SERVICE METEOROLOGIST, IS USING SATELLITE DATA TO CONSTRUCT VERTICAL MOISTURE AND TEMPERATURE PROFILES.

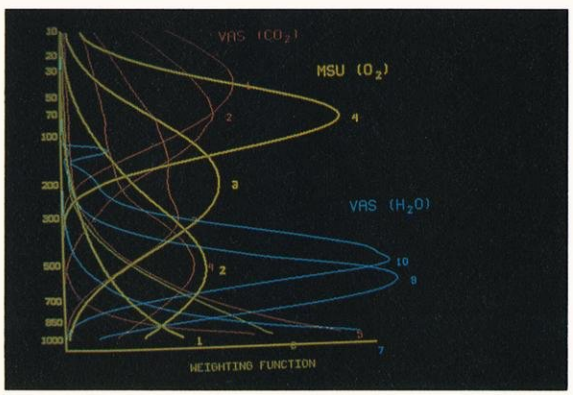
An Eye On Storms

Anthony Siebers, a National Weather Service meteorologist, has been working at the SSEC using McIDAS to analyze VAS (Visible and Infrared Spin-Scan Radiometer Atmospheric Sounder) data sent from GOES.

VAS was designed to probe and image the earth's atmosphere in the visible and 12 infrared spectral bands. "We are taking the spectral information from the VAS channels and constructing a vertical moisture and temperature profile," explains Siebers. "We want to process the VAS data right here in real time and make it available to a much broader audience."

Siebers' work at the SSEC serves the three operational weather centers: the National Meteorological Center in Washington, the National Hurricane Center in Miami, and the National Severe Storms Forecast Center in Kansas City. "We support the three on a seasonal basis. In mid-July we shift our satellite coverage from a two-swath area over the United States—which interests the National Severe Storm Forecast Center—to a more expansive coverage that includes latitudes the Hurricane Center wants to monitor."





VAS GLOBAL IMAGES IN VARIOUS WAVELENGTHS FOR CARBON DIOXIDE AND WATER VAPOR (LEFT); WEIGHTING FUNCTIONS FOR VAS CARBON DIOXIDE AND WATER VAPOR CHANNELS, AND MICROWAVE SOUNDING UNIT OXYGEN CHANNELS (ABOVE).

DONALD JOHNSON, PROFESSOR OF METEOROLOGY AND ASSOCIATE DIRECTOR AT SSEC (LEFT), AND PROJECT ASSOCIATE JOHN ZAPOTOCNY, ARE PRODUCING EDUCATIONAL VIDEOCASSETTES UTILIZING McIDAS IMAGERY.

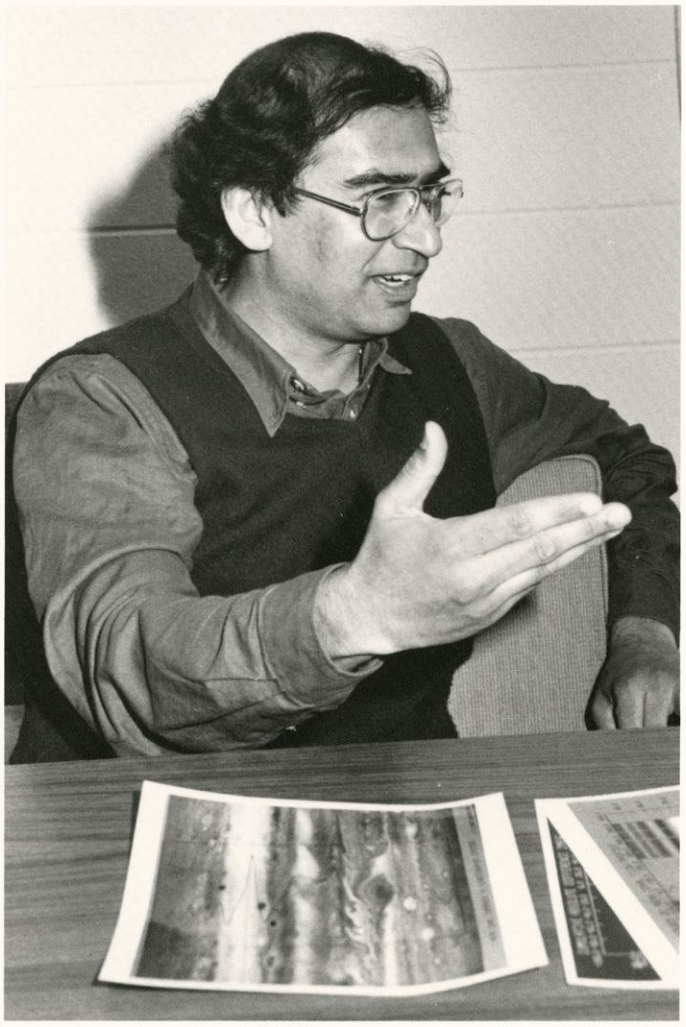
Educational Videocassettes

The National Science Foundation has funded Donald Johnson, an Associate Director at SSEC and a Professor of Meteorology, to produce educational videocassettes using McIDAS images. "We wanted the students in the classroom to benefit from using McIDAS by looking at the evolution of weather," says Johnson. "Most of the module content is satellite imagery, because that is the strength of McIDAS."

Johnson, working with Project Associate John Zapotocny, has completed five educational modules. Work continues on two more. "The really nice thing about using McIDAS in the classroom," observes Johnson, "is the ability to overlay different fields of data on an image. It is helpful to look at a field separately, then to overlay additional fields of data to see how they relate."

Several modules use case studies to present the subject matter. Zapotocny, who completed a module entitled "Tropical Cyclones" in June 1985, centered the McIDAS images on hurricane Alicia. "This module, by showing Alicia's entire ten-day life cycle in the Gulf of Mexico, is an excellent example of a hurricane's evolution and eventual interaction with a weather system from the north."

"We try to select items which will have a visual impact, but which also contain some scientific value," adds Johnson. "They may be used as stand-alone modules, or in conjunction with credit-hour courses."



SANJAY LIMAYE, ASSOCIATE SCIENTIST, STUDIES ATMOSPHERIC CIRCULATION ON OTHER PLANETS, SUCH AS JUPITER, USING McIDAS.

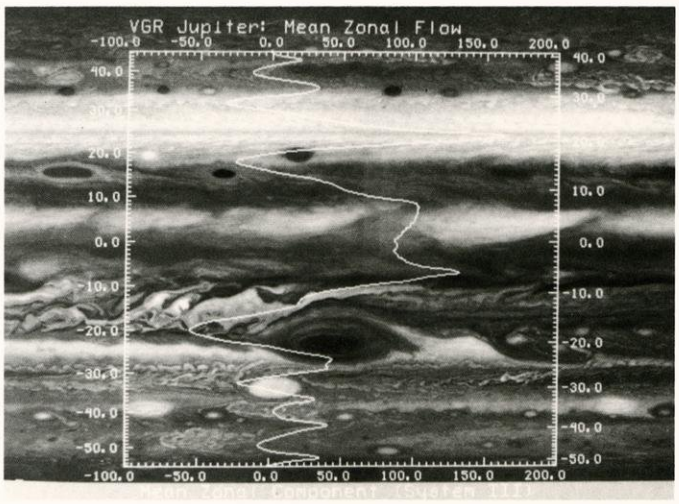
Analyzing Planetary Meteorology

Sanjay Limaye, Associate Scientist, uses McIDAS to study the atmospheric circulation of other planets. "We can take our image application programs and go from planet to planet without any difficulty. McIDAS' navigation and cloud motion measurement and meteorological analysis programs are general enough to enable a unified approach to the study of other planetary atmospheres," says Limaye.

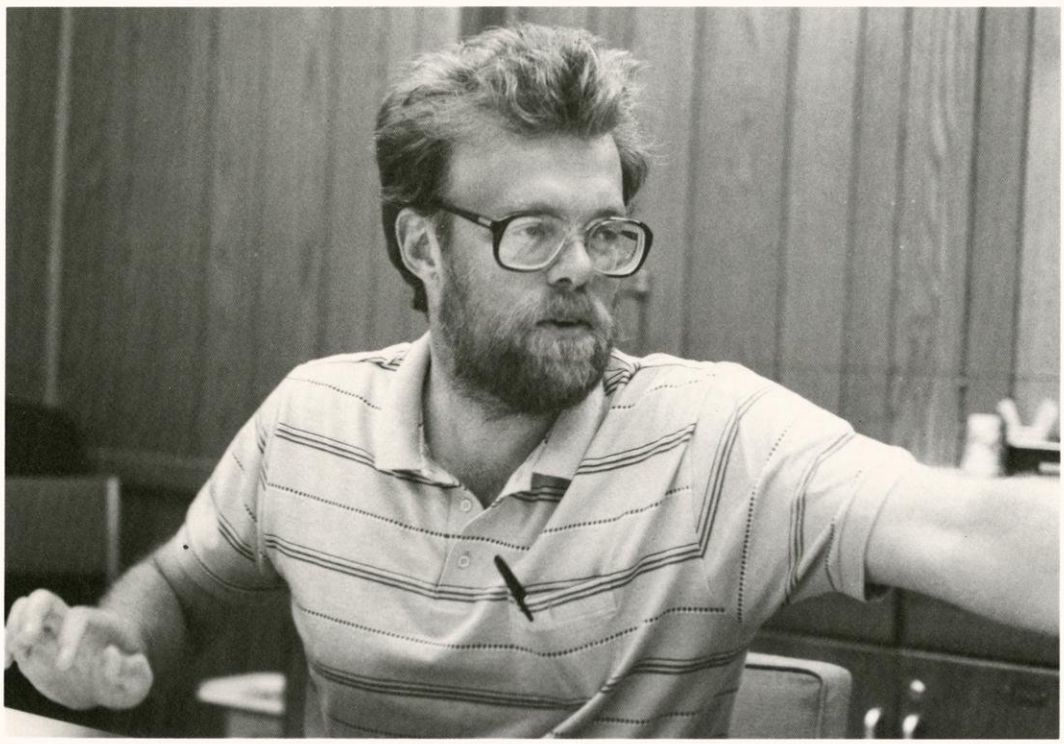
Central to this unified approach is a two-way path between points in a spacecraft image of a planet and the planet's physical coordinates, based on the geometry with which the image was acquired. "From this navigation, we can locate the clouds and measure their motions and see how the circulation evolves in time," says Limaye. "Watching Jupiter's clouds move is mesmerizing. You see an atmosphere rich in a variety of small and large scale circulations, evolving and yet stable. You just want to sit back and enjoy it, rather than tediously measure it."

Limaye studies the circulation of other planets because they are there. "The fact that I know the Jovian circulation better is not going to help me to decide whether or not to bring an umbrella tomorrow," he admits, "but it might help to understand our future climate."

Limaye emphasizes that no model exists that can yet predict the circulation of Venus, which is the simplest planet to study. "Some of the best minds have been studying the circulation on Venus, and we have yet to explain what happens there. Better comprehension of these physical processes may lead to advances in understanding some of earth's climate problems. The planets with their different conditions and circulations are a kind of weather and climate laboratory, so we don't need to perform experiments with our own."



A SATELLITE IMAGE OF JUPITER WITH THE MEAN ZONAL WIND COMPONENT SUPERIMPOSED.

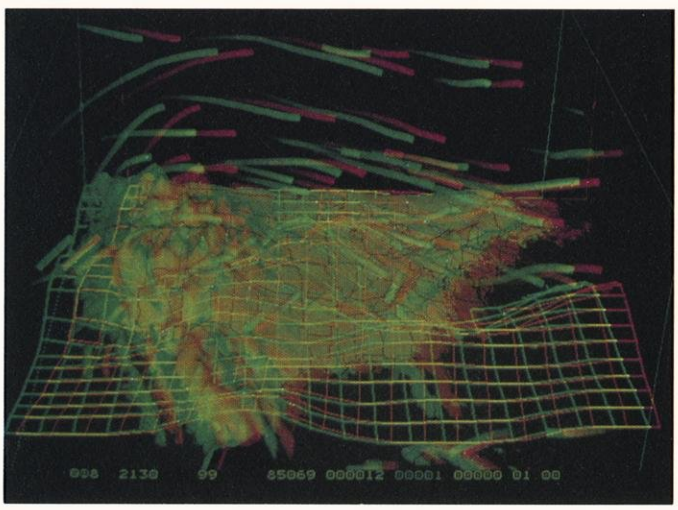


WILLIAM HIBBARD, AN SSEC SOFTWARE SPECIALIST, IS WORKING ON THREE-DIMENSIONAL DISPLAYS OF THE ATMOSPHERE.

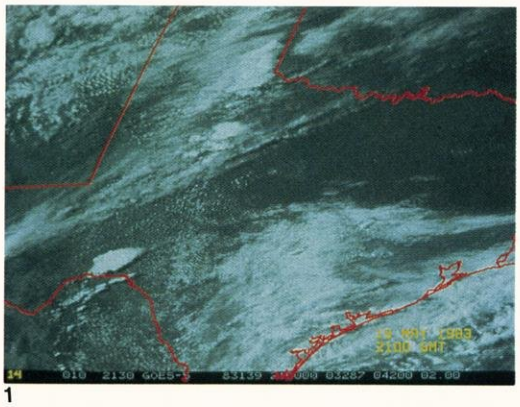
3-D Pictures and CAT Scans

William Hibbard is a software specialist at the SSEC who is interested in "pictures". He is developing improved techniques to display three-dimensional continuums of the atmosphere to meteorologists. "I want to bring out that third dimension. Few people are working on multivariate 3-D data display where it is necessary to cope with different parameters and phenomena in a single presentation."

In addition to depicting the atmosphere, Hibbard is developing 3-D images from CAT-scan data from the radiology department. "We want to draw each of these pictures in a fraction of a second, so that as I move the joy stick, the image will rotate," he says.



ATMOSPHERIC TRAJECTORIES IN RED-GREEN STEREO THAT WERE CREATED FOR 3-D VIEWING BY WILLIAM HIBBARD.



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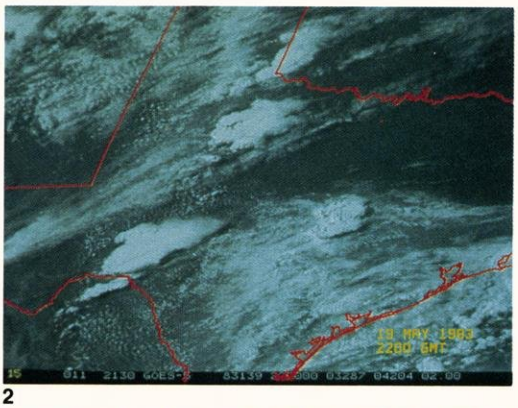

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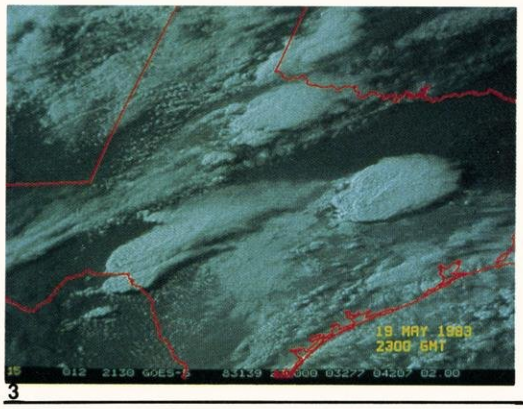

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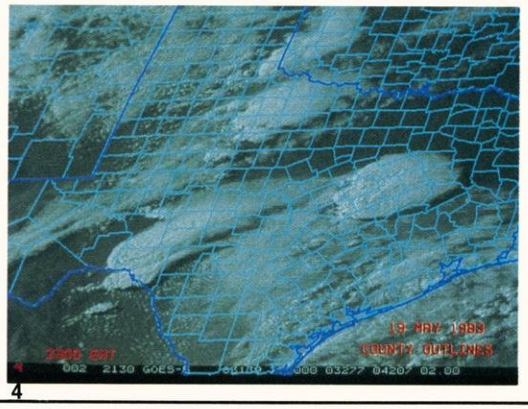
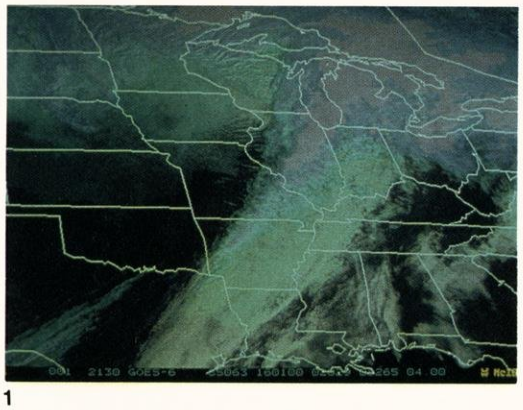


4

STORM CLOUDS BLOSSOM OVER TEXAS IN THIS HOURLY SEQUENCE. COUNTY OUTLINES, SHOWN IN THE FOURTH FRAME, ARE SUPERIMPOSED TO HELP METEOROLOGISTS ACCURATELY PINPOINT AREAS THAT ARE THREATENED BY SEVERE WEATHER.



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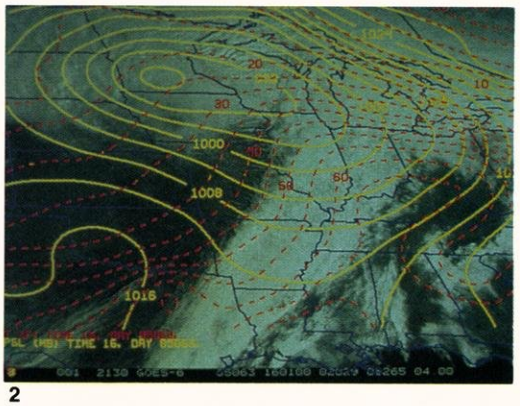

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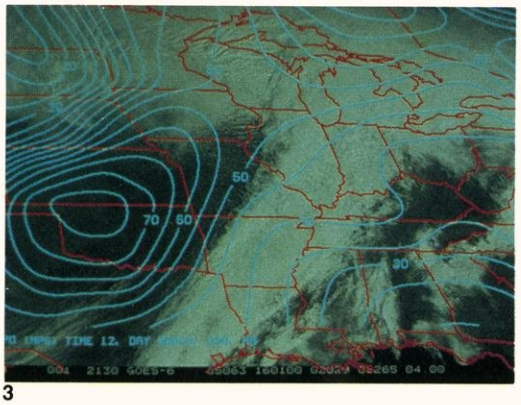

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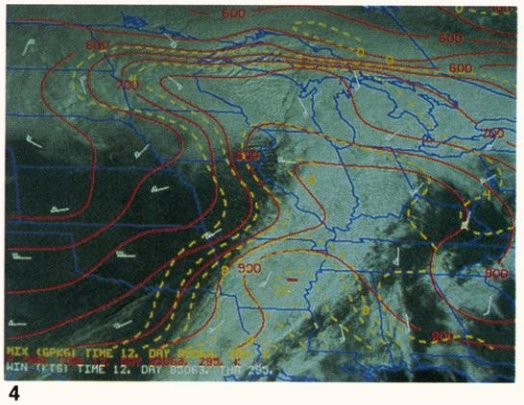

4

THIS SERIES OF FRAMES SHOWS SOME OF THE INFORMATION McIDAS SUPPLIED AS A WEATHER SYSTEM DEVELOPED OVER THE MID-SECTION OF THE UNITED STATES ON MARCH 4, 1985. 1) VISIBLE AND INFRARED CHANNELS COMBINED AND TINTED; 2) VISIBLE WITH SEA LEVEL PRESSURE CONTOURS (SOLID YELLOW) AND TEMPERATURE CONTOURS (DASHED RED); 3) VISIBLE WITH 300mb ISOTACHS; 4) VISIBLE WITH 295K ISENTROPIC SURFACE DATA, PRESSURE (RED CONTOURS), MIXING RATIO (YELLOW DASHED CONTOURS), AND PLOTTED WINDS.

On-Time Deliveries

Robert Oehlkers is an electronics technician at SSEC who builds and checks out McIDAS equipment. Frequently he installs new equipment at customer sites and teaches users how to operate and maintain the installation.

Just a few hours after installing a McIDAS system at Federal Express, company meteorologists re-routed several flights which ordinarily would have been cancelled. "Because of guaranteed delivery times, delayed flights can be expensive for Federal Express," relates Oehlkers. "Their meteorologists watched the satellite images closely to direct pilots in and out of airports before bad weather closed in."

The North Dakota Weather Modification Board, according to Oehlkers, sees an opportunity for McIDAS to save money for large agricultural operations as well. "If meteorologists can spot thunderheads before they build, pilots can seed them to produce rain instead of hail. A hail storm can flatten a wheat field so that it can't be harvested."

ROBERT OEHLKERS INSTALLS McIDAS EQUIPMENT AT CUSTOMER SITES OUTSIDE THE UNIVERSITY.

Autoradiographs of Protein Spots

David Santek, a programming specialist at SSEC, and Nancy Kendrick, an assistant scientist within the UW-Madison Biochemistry Department, are applying the imaging capabilities of McIDAS to process digitized films depicting protein spots.

To detect the effect of vitamins on protein synthesis, Santek and Kendrick compare complex patterns of radioactive gels exposed to film. "We decode the intensities of x-ray films to get the radioactive amino acid content for each spot on these complex gels to determine what Vitamin D is doing to the tissue," explains Kendrick.

"Previously, significant changes could be detected by viewing films on light boxes, but subtle changes were missed. I did that for several years," laments Kendrick, "and it was hard to compare complex patterns. McIDAS has enabled us to analyze faster and to study more data."

DAVID SANTEK, SOFTWARE SPECIALIST AT SSEC (LEFT), AND NANCY KENDRICK, ASSISTANT SCIENTIST WITHIN THE UW-MADISON BIOCHEMISTRY DEPARTMENT, ARE USING McIDAS' IMAGE PROCESSING CAPABILITIES TO DETERMINE THE EFFECT OF VITAMINS ON PROTEIN SYNTHESIS.

John T. Young, McIDAS Coordinator at the SSEC, intends to upgrade all the existing McIDAS workstations to include the IBM PC/AT. "Once we get McIDAS in the PC-DOS environment, we can do a wide variety of things," he says.

Young also wants to provide McIDAS via the IBM PC Convertible, a light-weight, "lap-top" microcomputer. "Pilots, for example, could download data to 3.5-inch diskettes along with their flight plans and have McIDAS images displayed in flight," suggests Young.

Verner Suomi, Director of the SSEC, says that along with larger computers, developments in instrumentation will continue to have a significant impact on meteorology. "These new instruments will allow us to see the earth in a much better way, as well as look out into space."

As computing power continues to grow, Suomi sees the need for improved networking and experiments with different levels of user interaction. "You need a computer, and in order to get the information to the users, you need to have good networking," says Suomi. "Otherwise we are back to drinking from the fire hydrant."

For further information contact:
Ms. Terry Gregory
Space Science and Engineering Center
1225 W. Dayton St.
Madison WI 53706
Telephone: 608 263-3373

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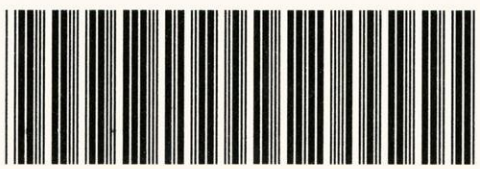

3/8/95

Science tips -- Add 2

JUPITER-COMET COLLISION: THE MOTION PICTURE

The comet Shoemaker-Levy's pummeling of Jupiter last July produced some memorable images of one of the solar system's most violent events. But for the first time, a scientist has caught it all in splendid motion, thanks to technology available at the UW-Madison Space Science and Engineering Center.

Sanjay Limaye, a planetary scientist at SSEC, teamed with researchers from the Swedish Royal Academy of Sciences (SRAS) to pull together remarkably crisp images of the comet collision in "motion picture" form. The images were collected from a unique solar telescope owned by the SRAS in the Canary Islands by Mats Lindgren, an astronomer at Uppsala University in Sweden.

The video was created in January with software from UW-Madison's McIDAS system -- short for Man-computer Interactive Data Access System. McIDAS is used to create meaningful images of the billions of bits of weather data collected from around the world. The software used by Limaye was developed with NASA's support to extend McIDAS tools to images of other worlds in the solar system.

Unlike any other images collected on Shoemaker-Levy, Limaye and Lindgren's video illustrates the "short-term evolution" of each of the comet's impact sites, including the expanding ring of mass from each collision. They were taken every 10 seconds over roughly four hours during consecutive nights after the comet's impact. Limaye will add more images to the video and present the work in May to the annual Space Telescope Science Institute meeting.

CONTACT: Sanjay Limaye, (608) 262-9541; limaye@ssec.wisc.edu

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POLLUTION CONTROL PROJECT MAPS OUT A CLEANER LAKE SUPERIOR

With most of the Great Lakes, a certain level of pollution has been "written off" as an unavoidable byproduct of developed shorelines. Not so for Lake Superior, where a recent binational agreement set a lofty goal of "zero degradation."

As a result of that U.S.-Canada pact, a number of state and federal water improvement projects have been established to keep the world's second-largest freshwater lake pristine. Stephen Ventura, a UW-Madison soil science professor, is in the second year of a project using Geographic Information System (GIS) technology to identify non-point source pollution in the Lake Superior watershed. The information is helping cities over 5,000 in population bordering Superior control their storm-water runoff.

In addition to identifying where most pollution is coming from, Ventura's digital maps can be used to help direct city planners to the best sites for detention ponds and settling basins to contain polluted water. Urban storm water typically carries a "witch's brew" of pollutants, from pesticides to volatile organic compounds. Ventura helps transfer GIS technology to officials from 14 cities bordering Superior, including Superior and Ashland, Wis.; Duluth and Hibbing, Minn.; and Marquette and Sault Ste. Marie, Mich. The research is helping these cities comply with the new U.S. Environmental Protection Agency standards.

CONTACT: Stephen Ventura, (608) 263-2086; sventura@macc.wisc.edu

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Science tips -- Add 3

'VIRTUAL FOLIAGE:' UW-MADISON DISPLAYS OVER 3,000 PLANT IMAGES ON-LINE

For professional botanists, students or simple nature lovers, that old indispensable pocket field guide now has a high-tech companion. UW-Madison's botany department has created a digital library of more than 3,000 plant images that is available publicly on the university's internet connection, WiscInfo.

Mike Clayton, an instructional specialist with the department, said the program is being used in botany courses to help students visually identify plants, define their characteristics and classify with other plant species. In a highly visual field like botany, Clayton says the educational benefits are phenomenal. Students can run random word-searches for specific images; enlarge, cut and paste images to serve classroom needs; and help self-correct their own observations from the field.

It also represents the future of botanical archives, Clayton said. Faculty who have their life's work collected in dusty boxes of 35 mm slides can have those images transferred in digital form, making them suddenly accessible to everyone. The collection is also highly adaptable to high school curriculum and for nature buffs trying to identify anything from wildflowers to morel mushrooms. The material is available under "Course Materials and Other Educational Resources" in WiscInfo, or on the World Wide Web.

CONTACT: Mike Clayton, (608) 262-2333; clayton@facstaff.wisc.edu

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— Terry Devitt, (608) 262-8282
— Brian Mattmiller, (608) 262-9772

note

From: University of Wisconsin-Madison / University News Service, 19 Bascom Hall, 500 Lincoln Drive, Madison, Wisconsin 53706
Telephone: 608/262-3571

ATTENTION: WEEKEND ASSIGNMENT EDITORS AND NEWS DIRECTORS:

A Project Fire press briefing will be held Sunday, Oct. 12 at 2 p.m. at Truax Field. Verner Suomi, a professor of meteorology and director of the UW-Madison Space Science and Engineering Center; and Steven Cox, a professor of meteorology at Colorado State University, will brief reporters on the massive cloud survey to take place in Wisconsin over the next three weeks. After the briefing, there will be opportunities to photograph the planes, including the NASA ER-2 (a version of the former U-2 spy plane), participating in the experiment. The briefing will be held in the National Guard Pilots' Briefing Room. Enter Truax Field by the gate at the corner of Mitchell and Hoffman Streets. The National Guard Building is half a block inside the gate. For more information contact Terri Gregory at (608) 263-3373 or Terry Devitt at (608) 262-8282.

Terry Devitt
Science Editor
University News Service

uw news

From the University of Wisconsin-Madison / News Service, Bascom Hall, 500 Lincoln Drive, Madison 53706 / Telephone: 608/262-3571

Release: Immediately 7/11/86

CONTACT: Terri Gregory (608) 263-3373

UW-MADISON COMMEMORATES SPACE WEEK

MADISON-- Wisconsin Gov. Anthony Earl has proclaimed July 16-24 "Space Week" following a national trend established in 1977.

To help celebrate Space Week, the University of Wisconsin-Madison is inviting the public to tour several of its space-related centers.

The Space Astronomy Laboratory (SAL) and the Space Science and Engineering Center (SSEC) will be open for tours Wednesday, July 23 hourly from 3-7 p.m. Each tour will last 45 minutes.

A branch of the astronomy department, SAL is the birthplace of the orbiting astronomical observatory -- the first space-based steller observatory. With funding from the National Aeronautics and Space Administration (NASA), laboratory staff designed and built sensitive optics for the high speed photometer component of the Hubble space telescope previously scheduled for launch aboard the space shuttle. The lab's latest project is the Wisconsin Ultraviolet PhotoPolarimeter Experiment (WUPPE) designed to calculate the direction of ultraviolet light from comets and stars. It also was scheduled for launch on the space shuttle. The Space Astronomy Laboratory is located on the sixth floor of Chamberlin Hall on the northeast corner of University Avenue and Charter Street.

The Space Science and Engineering Center develops space flight hardware, including the spin-scan camera, which in the 1960s took the first satellite

-more-

images of the earth from space. In the 1970s the Pioneer Venus probe carried a SSEC instrument called a net flux radiometer which measured altitudinal changes in temperature. Current SSEC projects include the high speed photometer and the X-ray spectrometer to be flown aboard the space shuttle. The center is located in the Meteorology and Space Science Building on the corner of Dayton and Orchard Streets.

In addition to the tours, the Washburn Observatory is hosting two stargazing nights during Space Week: at dark on Wednesday, July 16 and at 8 p.m. Wednesday, July 23. The observatory is located at 1401 Observatory Drive across from Lake Mendota on the UW-Madison campus.

Although not part of the Space Week festivities, UW-Madison's Instrumentation Systems Center and department of engineering mechanics also provide expertise to the space program. Engineering mechanics graduate Brewster Shaw twice flew aboard the space shuttle, once as the mission pilot.

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-- Inga Brynildson (608) 262-9772

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From the University of Wisconsin-Madison / News Service, Bascom Hall, 500 Lincoln Drive, Madison 53706 / Telephone: 608/262-3571

Release: Immediately 10/9/86

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SCIENCE/METEOROLOGY:
A small army of scientists is set to begin a massive three-week study of Wisconsin cirrus clouds using a version of the former U-2 spy plane and portable laser-driven radars. The project is the brainchild of pioneering UW-Madison space scientist Verner Suomi. 635 words

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CONTACT: Don Wylie (608) 263-7458

SCIENTISTS TO PUT WISCONSIN'S CLOUDS UNDER A MICROSCOPE

By TERRY DEVITT
University News Service

MADISON--Picture the following:

Satellite eyes zoom in on Wisconsin cloud cover. A NASA ER-2 -- a high-flying, long-winged aircraft packed with sophisticated meteorological gear -- soars aloft from Madison's Truax Field. Scientists in Oshkosh and Wausau deploy and aim portable laser-driven radars toward the heavens.

That scenario will become reality this week (Oct. 12) as scientists from around the country arrive in Wisconsin to begin an intensive three-week field study of cirrus clouds, feather-shaped streamers that play an important role in determining climate.

"We're trying to build tools to predict climate," said Don Wylie, a University of Wisconsin-Madison Space Science and Engineering Center scientist and an assistant manager for the project.

"You hear a lot about the greenhouse effect and the potential for climate change from things like volcanic eruptions," Wylie said, "but over the long-term, clouds play a far more important climatological role than any of

-more-

those other things."

The brainchild of UW-Madison's pioneering space and weather researcher Verner Suomi and Francis Bretherton of the National Center for Atmospheric Research in Boulder, Colo., the project is known as FIRE, a much shortened version of First International Satellite Cloud Climatology Program Regional Experiment. It is being directed by Steven Cox, a Colorado State professor and former student of Suomi's.

Some 40 scientists and a small army of technicians, support personnel and students from 10 universities and federal agencies will take part in the study.

They will employ the ER-2, a version of the former U-2 spy plane. The ER-2, equipped with infrared sensors and other gear designed to sample cirrus clouds, will crisscross the southern half of Wisconsin at altitudes as high as 70,000 feet.

According to Wylie, there will be at least two other aircraft equipped with sensors and particle samplers involved in the cloud survey. In addition, at least four weather satellites will contribute information during the course of the FIRE field survey.

In Oshkosh, Wausau and Madison scientists will deploy laser-driven radar known as LIDAR. By firing laser pulses at cirrus clouds and monitoring the reflection, much as radar operators monitor echoes produced by radio waves, scientists can determine such things as cloud height and density.

Why all this interest in cirrus clouds?

"There are two big problems in climatology," said Suomi. "One is the effect of oceans on climate and the other is the effect of clouds on climate."

The clouds scientists think might be the most important in determining climate are cirrus clouds, the type to be studied in the upcoming FIRE field survey, and marine stratus clouds, low clouds that form in layers over the ocean and that usually cover a large area of sky.

Add 2--Clouds

Marine stratus clouds will be the subject of a second intensive FIRE field survey next summer off the coast of southern California.

The two types of clouds are important to climate because they cover an estimated 70 percent of the Earth's surface. And although both cloud types play an important role in determining climate, they do so for different reasons, according to Wylie.

"Cirrus clouds can do the same thing as the so-called greenhouse effect," Wylie said. "They're thin clouds that let sunlight through, yet they act like a blanket and trap infrared radiation emitted by the Earth. Marine stratus, on the other hand, reflect sunlight and because they're low in the atmosphere they become very warm and emit infrared radiation to space."

According to Suomi, the two principal goals of FIRE are to learn more about the effect of cirrus and marine stratus clouds on the Earth's radiation budget and also how those two types of clouds form and decay.

"We have an almost trivial understanding of cirrus clouds," Suomi said. "We need a basic understanding of cloud system evolution and their radiative properties. We need that understanding to improve our weather and climate prediction models."

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-- Terry Devitt (608) 262-8282

uw news

From the University of Wisconsin-Madison / News Service, Bascom Hall, 500 Lincoln Drive, Madison 53706 / Telephone: 608/262-3571

Release: Immediately 1/28/86

SHUTTLE TRAGEDY HITS UW-MADISON RESEARCHERS HARD

By TERRY DEVITT
University News Service

MADISON--The shock of Tuesday morning's explosion of the Space Shuttle Challenger is being felt especially hard by University of Wisconsin-Madison scientists and engineers.

Researchers in the UW-Madison Space Astronomy Laboratory had been looking forward to the deployment of a multi-million dollar ultraviolet telescope scheduled to fly on the next shuttle mission planned for March 6. The lab has had a long working relationship with NASA,

"Our lab has participated in NASA space programs for the full 26 years of its existence," said lab Director Arthur D. Code. "The tragic explosion of the Space Shuttle Challenger this morning is singular in its impact on those of us in the lab."

Code said he was uncertain of how the loss of Challenger and its seven-member crew will affect next month's scheduled launch of Columbia, the shuttle now being prepared to fly the first of the three Astro missions.

The Astro missions will carry an array of ultraviolet telescopes, including one designed and built at UW-Madison. The Wisconsin telescope is known as WUPPE, for Wisconsin Ultraviolet Photopolarimetry Experiment.

"At this moment, of course, we have no idea of the effect this will have

-more-

on the nation's space program or our own activities, which were geared to the next shuttle launch," Code said in a prepared statement. "We feel a sense of shock and grief for the crew and their families.

"That the adventure in space will continue is not in doubt, but until it is understood what happened today that adventure will be on hold."

Ken Nordsieck, a UW-Madison professor of astronomy, is scheduled to fly the second Astro mission as a payload specialist. That mission was scheduled for late 1986.

In addition to WUPPE, two other major UW-Madison projects were scheduled to be launched on space shuttles this year. The Hubble Space Telescope, an orbiting observatory the size of a bus, was tentatively scheduled to be placed in Earth orbit in late October. Part of the telescope's scientific payload is a high-speed photometer designed by UW-Madison scientists and built at the Space Science and Engineering Center (SSEC) here.

Also scheduled to be launched aboard the shuttle this year was the Diffuse X-ray Spectrometer, a $5.5 million device designed to detect and measure X-rays emitted by hot gas in interstellar space. The gas is thought to be the remains of stars that exploded hundreds of thousands of years ago.

Verner Suomi, director of UW-Madison's SSEC, said he hoped the tragedy would not obscure the many benefits of space exploration.

"In the space program we have both triumphs and tragedies. Last week's encounter with Uranus was certainly a triumph," Suomi said. "Today's tragedy tends to make us forget the triumphs."

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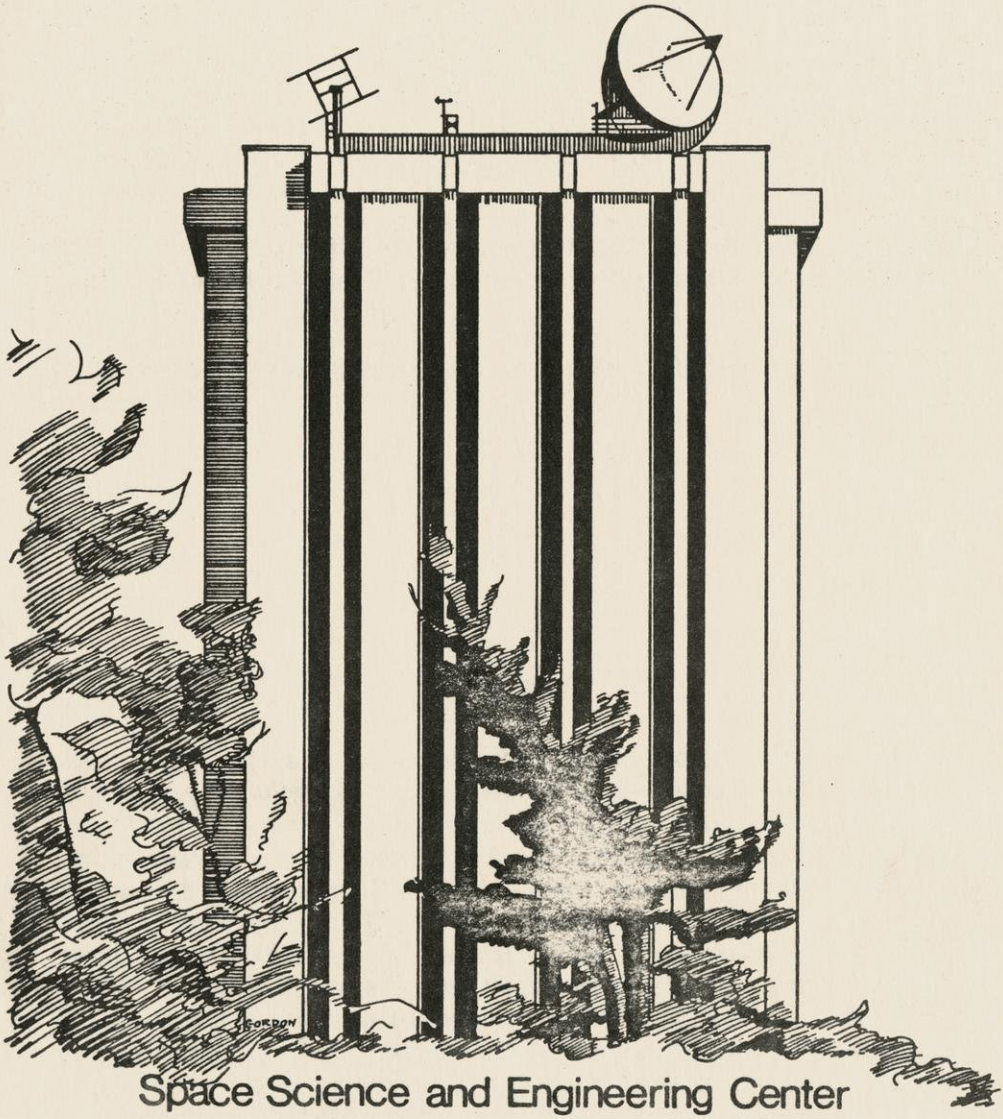
-- Terry Devitt (608) 262-8282

Space Science + Engineering Center

UNIVERSITY OF WISCONSIN - MADISON



Space Science and Engineering Center

1981

Introduction

The Space Science and Engineering Center of the University of Wisconsin—Madison campus is an independent research unit of the Graduate School. SSEC conducts a broadly based research program and is organized to provide administrative, technical, fabrication, and field assistance to space related activities of all University departments.

The Center's mission is threefold:

1. To conduct multidisciplinary research programs in space science and engineering and to maintain a staff to carry out these programs and to assist Center users;

2. To provide administrative, financial, and facility assistance in support of student training in all aspects of engineering, space experiment, and space science programs;

3. To assist in the dissemination of results of the University's space programs.

Facilities

The Center occupies the lower seven floors of a modern sixteen-story building on the Madison campus. The building was built in 1969 jointly by the National Science Foundation, the National Aeronautic and Space Administration, and the State of Wisconsin and is dedicated to "the understanding of man's physical environment and its use for the benefit of mankind." In addition to SSEC, the building houses the largest Department of Meteorology in the nation, the Institute for Environmental Studies, the Center for Climate Research, the Marine Studies Center, the Oceanography and Limnology Graduate Program, the Office of the State Climatologist, and a laboratory of the National Environmental Satellite Service (NESS). Many cooperative programs in teaching and research are assisted by the proximity of these departments.

The SSEC building is easily identified by the two 7.3 meter diameter antenna reflectors mounted on the roof which receive earth images continuously from two Geosynchronous Operational Environmental Satellites (GOES). Other antennas receive thermal sounding data from the TIROS-N satellites and permit point-to-point communication through the Advanced Technology Satellites. Signals from the antennas are routed to the sixth floor where a unique multiprocessor data facility is located. The data facility is based on the Man-computer Interactive Data Access System (McIDAS) development program which is described below. A Data Base Manager (DBM) with 600 megabytes of disk storage receives and files data from the GOES and TIROS-N satellites, from surface, upper air, aircraft and ship weather reports, and from many other sources. At present, four medium-sized computers operate as Applications Processors (A/P) fed from the DBM. Each A/P supports from one to four interactive video terminals, some of which are located in other cities.

Each terminal provides a scientist or student with the ability to access any of the data in the DBM instantly, or any of the data in the extensive SSEC archives within a few minutes. Scientists can perform a large number of data and image manipulations, meteorological analyses, and quantitative measurements with great speed and efficiency from any of the terminals. Meteorological research and educational programs are the major users of the data facility, but medical, biological, astronomical, and many other types of data are processed also. The data facility is unique in its scope, flexibility, and efficiency.

Under the sponsorship of the National Oceanic and Atmospheric Administration (NOAA), SSEC records all of the images from the two GOES satellites in the western hemisphere and the GOES satellite located over the Indian Ocean. The equipment capable of recording this enormous data volume (1.9×10^{11} bits per day) at low cost was developed and built by SSEC. Through the Environmental Information and Data Service (EIDS) of NOAA, SSEC serves as the national archive of GOES data.

On the fifth floor a super-clean (class 10,000) room is maintained and semi-clean electronics assembly rooms are interconnected through dust locks. These facilities are essential for the assembly of spacecraft hardware. Adjoining the assembly room, SSEC operates a complete quality assurance and test facility staffed by a full-time engineer trained and qualified in NASA quality assurance procedures. Also on this floor, the microprocessor programming facility provides the capability to develop microprocessor firmware and to "burn" PROMs.

The major electronics laboratory and equipment room, the drafting room and offices for the engineering staff occupy the fourth floor. The SSEC is well equipped to design, fabricate, and test state-of-the-art electronics equipment. The third floor has extensive photographic facilities and is also the home of the administrative offices of the Center. The second floor is specially equipped to support space medicine research. Techniques for precise measurement of bone mineralization and tissue density were developed here and used in the manned space program. Work continues at this time to apply this valuable diagnostic capability in regular hospital practice.

The first floor houses the extensive SSEC library of meteorological satellite pictures. The images in this library date from the first TIROS and provide users the longest time history of satellite images available anywhere.

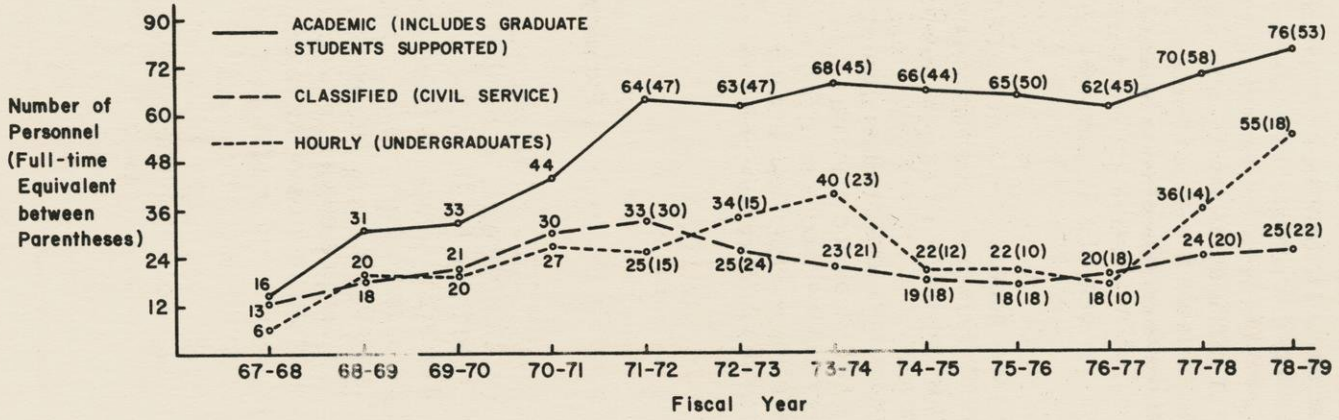
Thermal-vacuum test chambers, an equipment vibration test facility, and wood, sheet metal, and machine shops occupy the basement of the building. The machine shop is equipped with modern, precision machine tools and staffed by an expert instrument maker experienced in meeting the high standards required for spacecraft hardware.

Funding

From the start of SSEC in 1966, the major sources of support have been the federal agencies interested in the application of space technology to meet society's needs. The NASA, NOAA, and NSF are principal sponsors. The State of Wisconsin, through the University, has been generous in providing housing, heat, and other physical support. In addition, salary support is provided sufficient to meet the federal agencies' requirements for cost sharing. The Center's budget for direct costs is now about $3 million per year of which approximately 98 percent comes from federal grants and contracts.

Its Greatest Resource—People

The Center has long realized that its greatest resource is people—their diversification and the talent they bring to the University. The premise of "hire good people, give them a job to do and a sense of responsibility, then get out of their way," has resulted in a continuing growth of new program activity and a flexible personnel picture. This growth is evident in the chart presented below:



Some Recent Programs

Pioneer Venus Net Flux Radiometer Experiment

A net flux radiometer was conceived and developed at SSEC for use on the small probes of the Pioneer Venus Multiple Entry Probe Mission to measure the deposition and loss of the radiative energy which powers atmospheric motions on Venus. The development work resulted in a small, rugged, and highly accurate sensor which could measure small flux divergences even at the 500°C surface temperature of Venus. The successful operation of these sensors in the hostile atmosphere of Venus verified the system design and excellent data were obtained. Analysis of the net flux data and correlation with other measurements is continuing.

VAS (Visible Infrared Spin Radiometer Atmospheric Sounder)

The VAS instrument, scheduled to fly on a geosynchronous spacecraft in early 1981, was conceived at SSEC to provide the capability to probe and image the earth's atmosphere in the visible and twelve infrared frequencies. The combined data from these spectral bands will yield vertical profiles of temperature and humidity from the surface of the earth to the top of the atmosphere. Since VAS is in a geosynchronous satellite, it will be possible to probe the same region of the atmosphere repeatedly to determine the rate of change of temperature and moisture. This information may help to explain instabilities and energy exchange patterns that cause short-lived weather phenomena such as thunderstorms, tornadoes, and dust storms. The SSEC is responsible for leading the NASA-NESS-SSEC team in developing the techniques and data processing system to exploit the VAS capability.

FGGE—First GARP (Global Atmospheric Research Program) Global Experiment

Because SSEC had developed the interactive techniques for measuring cloud motions, the Center was requested by NOAA to produce mesoscale cloud vector sets over the tropical oceanic regions for FGGE. These vector sets are needed to fill gaps in the global weather net and can be obtained only from satellite images. The data processing task, production of over 4,000 cloud vectors per day, is large and has required a large expansion of the SSEC data processing faculty. When the USSR failed to orbit their geosynchronous meteorological satellite in time for FGGE, a "spare" US GOES satellite was moved into position over the Indian Ocean. The SSEC was called upon to build the equipment required to record the complete output of this satellite which is being operated by the European Space Agency in Villafranca, Spain. Data from the Indian Ocean GOES is mailed to SSEC for processing.

Space Telescope High Speed Photometer

In March 1978, SSEC began design of the high speed photometer (HSP) instrument for the Space Telescope scheduled for launch in late 1983. The Center is responsible for design, fabrication, and testing of the instrument detectors, electronics, and structure. The high speed photometer will be a scientifically versatile instrument, designed to make precise observations of rapidly varying sources over very small time periods. The instrument will sense ultraviolet radiation of faint objects, unobservable with previous space instruments, and will make measurements at visible wavelengths with higher precision and to fainter magnitudes than is possible from earth.

DMSP (Defense Meteorological Satellite Program) Library

This lending archive was established in 1973 and operates as part of the Environmental Data and Information Service of the National Oceanic and Atmospheric Administration (NOAA). Images produced by two satellites are received in the form of positive transparency filmstrips 9-1/2 inches wide and are catalogued for later retrieval as needed. The DMSP satellites operate in 450 nm circular sun-synchronous orbits. Both visual and infrared images are retrieved at a resolution of 1.5 nm. A limited number of images are available at a resolution of 1/3 nm. The DMSP Library provides data at nominal cost by loaning the original filmstrips and supplying photoreproductions. It furnishes data to investigators of the atmosphere from the United States and many foreign countries.

Diagnostic and Numerical Modeling Studies of Extratropical Weather Phenomena

Several SSEC research programs are investigating the dynamics of midlatitude synoptic and mesoscale weather systems. Detailed diagnostic studies of observed and numerically simulated extratropical cyclones seek a better understanding of the cyclone's evolution and the development of verification techniques for numerical weather prediction. Studies to improve short range (0-6 hour) forecasting using a combination of satellite and conventional data available on McIDAS are in progress. Research is also focused on dynamics of deep convection and squall lines employing case studies and numerical model experiments.

Rainfall Estimates from Geostationary Satellite Data

The SSEC has developed a technique for estimating convective rainfall from satellite visible and infrared image sequences. The technique is based on an empirical relationship between volumetric rainfall rate and cumulonimbus cloud area and cloud area change. Satellite rain estimates are found to be useful on scales as small as individual thunderstorms.

OSO Soft X-Ray Experiment

This spacecraft hardware effort produced a basic system designed to detect and measure low-energy X-rays from the OSO-I spacecraft. The 100-pound instrument contained six gas-filled proportional counters, 18 amplifiers, 6 level detectors, a data-handling system, a pneumatic control system, all of which operated on 7 watts electrical power. The SSEC also developed and built coaxial anode wires for use in gas-filled proportional counters.

The soft X-ray experiment instrument flew aboard the OSO-I spacecraft launched in June 1975. Although designed to operate for two years, the instrument continued to collect good scientific data for nearly three and one-half years. In October 1978, the spacecraft was turned off. The data collection has resulted in high sensitivity observation of 15 percent of the sky, with spacial structure of diffuse background X radiation determined to a resolution of 3°.

McIDAS (Man-computer Interactive Data Access System)

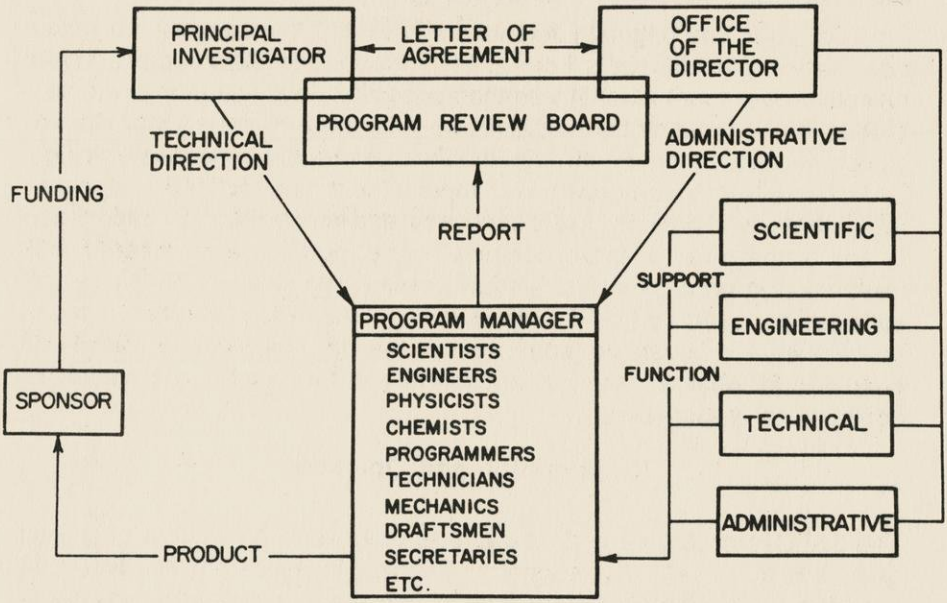
This program was originally intended to develop the capability to obtain quantitative measurements from geosynchronous satellite images. These objectives were met in 1974 with the successful demonstration of efficient production of cloud motion vectors from ATS data. However, McIDAS development has continued through the third generation of hardware design, and extensive software growth and improvement. The McIDAS is a powerful system which provides rapid access to, and interaction with, information in any of the three possible domains—word, number, and image. It has been used to process a great variety of data. The McIDAS hardware and software are used by USAF, USN, NASA, NOAA, and more than a dozen universities and private meteorologists in the US. The McIDAS software is operating in West Germany and Canada and the number and variety of applications is increasing.

Organization and Operation

The SSEC is organized and operated to emphasize attainment of project goals and to give effective support to Principal Investigators. Full-time staff includes approximately 67 scientists, engineers, specialists, and technicians. Of these, 18 have Ph.D. degrees in Meteorology, Physics, Anthropology, Engineering, and Medical Physics, and 23 have M.S./M.A. degrees in these same disciplines as well as in Business Administration, Chemistry, Mathematics, and Library Science. In addition, 35 to 50 graduate and undergraduate students are at work on SSEC projects.

The chart below illustrates the normal mode of operation in SSEC. A Principal Investigator originates a program and, by letter of agreement, arranges for the help he needs from SSEC. Members of the SSEC staff, students, and others drawn from the University at large are assembled by SSEC and a Program Manager is designated. The Program Manager works under the technical direction of the Principal Investigator and calls upon the SSEC staff for support in administrative, financial, personnel, and procurement matters. Periodic reviews are held with the SSEC Director and the Principal Investigator to assure prompt attention to problems. Of course, arrangements are varied to meet particular program needs.

SSEC ORGANIZATION and OPERATION CHART



Further Information

Individuals desiring further information on Center activities should write to:

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University of Wisconsin—Madison
1225 West Dayton Street
Madison, Wisconsin 53706

or call:

Robert J. Fox
Executive Director
608/262-0544

1979

uw news

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CONTACT: Tom Achtor (608) 263-4206

UW-MADISON COMPUTER SOFTWARE HELPING HURRICANE-PRONE BANGLADESH

By TERRY DEVITT
University News Service

MADISON-- From 400 miles up, through a satellite's eye, the massive delta at the mouth of the Ganges and Brahmaputra rivers looks fertile and calm.

But when powerful hurricanes blow up the Bay of Bengal and lash the Bangladesh delta, the low-lying islands and coastal lowlands become watery death traps for thousands of people.

The most recent hurricane struck Bangladesh just last month and claimed nearly 15,000 lives. But it might have been even worse, according to University of Wisconsin-Madison meteorologist Thomas H. Achtor.

A recently-installed satellite receiving station and a computer system powered by software developed at the UW-Madison Space Science and Engineering Center (SSEC) enabled thousands of people to flee the powerful storm and the devastating tidal surge that accompanied the hurricane.

Provided to Bangladesh by the U.S. Agency for International Development, the receiving station and computer had just been dedicated when the latest storm loomed off the coast of the populous Asian country.

"Bangladesh news reports are crediting this new satellite receiving and processing station with saving thousands of lives," Achtor said. "They never had direct access to weather satellite pictures before, and when they got the

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system going, they were able to see this big cyclone moving up the Bay of Bengal."

To accurately predict the course and strength of tropical storms, forecasters need vast amounts of temperature and moisture information from the middle and upper parts of the atmosphere, information a satellite is particularly suited to provide.

Usually, meteorologists rely on weather balloons to monitor the atmosphere. But balloons can gather information at just one point. A satellite's sensors can sweep much broader areas, including remote ocean areas where little or no meteorological data has previously been collected.

According to Achtor, the computer is fed a constant stream of this data from a U.S. polar-orbiting weather satellite. This information -- pictures and radiation measurements which give forecasters a read on atmospheric temperatures, moisture and winds -- is processed by the computer in seconds and can give storm watchers so-called "real time" images of storms.

Achtor said the quick access to weather information provided by the system is crucial so that people in the path of a hurricane can be warned in time.

"To save lives, a 24-hour lead time is needed for a hurricane forecast," he said. "People need time to evacuate low-lying areas, where most hurricane fatalities occur. In Bangladesh, the delta lands are very, very flat and barely above sea level."

Aside from helping monitor killer storms, the system also will benefit farmers and fishermen in Bangladesh, Achtor said. The polar-orbiting satellite, known as TIROS, can provide information on moisture content of the soil, important for agricultural forecasts, and it can give fishermen an idea of where warm and cold ocean currents are, a help in locating fish.

Achtor will travel to Dacca, Bangladesh in August to show meteorologists there how to use the large computer software library provided by UW-Madison.

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From the University of Wisconsin-Madison / News Service, Bascom Hall, 500 Lincoln Drive, Madison 53706 / Telephone: 608/262-3571

Space Science Engineering Center

Release: Immediately 12/11/85

CONTACT: Andrea Tuffli (408) 742-7480, Evan Richards (608) 263-6775

UW-MADISON STAFFER NAILS DOWN A NASA "SNOOPY AWARD"

MADISON--Andrea Tuffli is good at knocking down barriers.

A member of the University of Wisconsin-Madison academic staff, Tuffli joined the elite of the aerospace industry recently when she was presented with a NASA "Snoopy Award," an award earned by less than 1 percent of all those who help plan, construct and test the nation's spacecraft and satellites.

Tuffli is one of the few women to win the award. She was cited for her work as test team leader for the high-speed photometer component of the $1.2 billion Hubble Space Telescope now undergoing testing at Lockheed Missiles & Space Co. in Sunnyvale, Calif.

Recipients are chosen by the astronauts who fly the spacecraft and who deploy the satellites and complex scientific instruments in space. Tuffli received her award from astronauts John W. Young, Bruce McCandless and Katherine D. Sullivan, members of the shuttle crew that will deploy the 25,500-pound space telescope in 1986 or 1987.

"It's really quite a compliment. I never expected to get one of these things," she said, referring to the small silver pin of the cartoon character made famous in Charles Schulz's comic strip Peanuts. The award was created during the Mercury program of the early 1960s when Schulz gave NASA permission to use the likeness of the famous beagle.

The award was given to Tuffli for her "'can do' attitude and tireless

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contributions" to the development of a successful testing program for the high-speed photometer.

Built at the UW-Madison Space Science and Engineering Center, the high-speed photometer is one of the space telescope's five scientific instruments. It is intended to probe the heavens for rapidly pulsating stars, neutron stars and black holes.

A Madison native, Tuffli received her undergraduate degree from UW-Madison in physics and mathematics, fields noted for a preponderance of male practitioners. Now Tuffli is one of a handful of women in a group of 150 people helping to test the space telescope and its scientific payload.

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From the University of Wisconsin-Madison / News Service, Bascom Hall, 500 Lincoln Drive, Madison 53706 / Telephone: 608/262-3571

Space Science & Engineering Center

Release: Immediately 4/10/85

CONTACT: Robert J. Krauss (608) 262-9523

McMURDER, IT WROTE: THE CASE OF THE FUZZY VIDEOTAPE

By TERRY DEVITT
University News Service

MADISON--Bob Krauss, scientist and student of extraterrestrial weather, solves mysteries.

Usually, Krauss and his co-workers at the University of Wisconsin-Madison's Space Science and Engineering Center help unlock the secrets of the planets. By carefully analyzing space probe pictures of Jupiter, Saturn and the other planets in our solar system, Krauss has shed new light on mysteries that have puzzled planet watchers for hundreds of years.

But using UW-Madison's McIDAS, a sophisticated meteorological research computer, Krauss helped solve a different kind of mystery recently -- a murder mystery that could have ended with two sailors going to prison for a crime they did not commit.

"The case involved the robbery and murder of a Racine cab driver last Memorial Day," said Krauss, a UW-Madison academic staff member. "A couple of sailors from the Great Lakes naval base in northern Illinois were arrested and charged with the crime."

At the trial last November, the prosocution introduced a surveillance videotape that purported to show the defendants in a gas station near the scene of the crime. According to Krauss, the tape was a key piece of evidence, but the images of the suspects' faces were not clear.

The prosecution contended that the accused were the two people shown on

-more-

the videotape, which was made shortly after the crime was committed. The defense claimed the sailors were elsewhere and were not the people shown on the tape.

That's when Krauss, who spends much of his time poring over thousands of TV images sent to earth by the two Voyager spacecraft, got into the picture.

"Originally, the public defender's office just wanted somebody who could process the videotape and enhance the images similar to what is done with the pictures taken for the space program," said Krauss. "They asked us to run the same type of program on the surveillance videotape that we use to analyze the Voyager cloud pictures from Jupiter, Saturn and Uranus.

"They wanted us to come up with clearer pictures so that it would be possible to tell for sure if the defendants were or were not the people on the videotape," he said. "It became clear to me, after working on the tape and running the enhancements on it, that it was highly unlikely that the people on the videotape were the sailors suspected of the crime."

Using McIDAS, Krauss was able to make the images clearer by removing the distortion. He also was able to bring out certain facial features, but he emphasized that the computer enhancements in no way changed the basic information on the videotape images.

"We are able to bring out or subdue certain features in an image, but of course you have to be careful that you don't destroy meaningful information. What we try to do is improve the ability of the viewer to see what is really in the image."

Taking his analysis a step further, Krauss noticed certain fixed features in the station -- shelves, counters and furniture -- that could be used to determine the exact height of the person shown on the tape.

"I went to the filling station in Racine and made some measurements of the room and the various pieces of furniture. Then, by using some very simple geometry and the results of my measurements, I was able to demonstrate rather

conclusively that one of the people on the tape was only about 5 feet 8 inches tall whereas the defendant was 5 feet 10 inches tall," Krauss said.

"He would have had to have walked around with his knees bent the entire time he was in the filling station in order to show up on the videotape the way he did," Krauss added. "That evidence was virtually incontrovertible. You could look at the enhanced pictures and say 'Well, that could be the suspect or it couldn't be the suspect,' but there was no way to fake the geometry."

Richard J. Johnson, the public defender who represented one of the accused sailors, said Krauss's expertise was crucial to the defense.

"He was very important to our case," Johnson said. "He couldn't make the picture crystal clear, but he could make it better and he also proved that the guy (in the picture) was just too short."

According to Johnson, he discovered Krauss and McIDAS in a rather roundabout way. He said he spent the better part of a day calling various institutions around the country to find someone who could enhance the tape.

"I did locate one person at the Jet Propulsion Laboratory in California," Johnson said, "but he said he couldn't do it unless it was a national emergency."

Johnson said someone finally put him in touch with Verner E. Suomi, director of the Space Science and Engineering Center, who told him that the center could accommodate his request.

The only sad note to the whole affair, said Krauss, was that while two men were tried for a crime they didn't commit, the trail of the real killer or killers grew cold and is unlikely to be picked up, even with the help of space-age technology.

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-- Terry Devitt (608) 262-8282

uw news

From the University of Wisconsin-Madison / News Service, Bascom Hall, 500 Lincoln Drive, Madison 53706 / Telephone: 608/262-3571

Release: Immediately 8/12/83

HIGH-TECH PIGEON; HIGH-FLYING OFFSPRING?

MADISON--A high-flying pigeon with a flair for high technology ran out of nesting time this week.

The mother pigeon had picked a space age location and material, crafting her nest totally of plastic amid satellite antenna dishes atop the 16-story Space Science and Engineering Building at University of Wisconsin-Madison.

An antenna painting crew found the bird's "state of the art" home last month nestled inside the base of a nine-foot dish antenna. Built solely from thin plastic strips a few inches to a foot long, it held two real eggs.

A Space Science employee said the fast-learning pigeon had scavanged leftover snippets of plastic used originally to tie electronic cables together. "Not only is this a high-tech pigeon," she said, "this is a recycling pigeon."

Crew members waited three weeks to see if the eggs would hatch, but had to get on with the repainting job this week. A student employee moved the eggs (Tuesday, Aug. 9) to "a more protected area" on the roof, a spokeswoman said.

Unfortunately, either pigeons make clumsy engineers or the technology was unsuitable. The nest itself wasn't sturdy enough to move.

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uw news

From the University of Wisconsin-Madison / News Service, Bascom Hall, 500 Lincoln Drive, Madison 53706 / Telephone: 608/262-3571

Release: Immediately 7/8/82 jhs

CONTACT: Robert C. Bless (608) 262-1715/263-3071

UW-MADISON'S SPACE TELESCOPE COMPONENT SHIPPED

MADISON--The first scientific package completed for NASA's Space Telescope was shipped Wednesday (July 7) by its designer and builder, University of Wisconsin-Madison's Space Science and Engineering Center, to Goddard Space Flight Center in Maryland.

The high-speed photometer and associated ground support equipment will undergo extensive testing at Goddard before being assembled on the telescope, said astronomy Professor Robert C. Bless, principal investigator for the project. The photometer and four other instrument packages will be attached to the telescope when, if NASA schedules hold, it is carried into a 350-mile-high orbit by the Space Shuttle in March 1985.

Trucked to Maryland via moving van in 22 boxes and crates, many painted in cardinal and white school colors and festooned with Bucky Badger decals, the photometer is designed to measure variations in light intensity 100,000 times a second.

Attached to the receiving end of the Space Telescope's 96-inch mirror, and unhindered in space by earth's atmosphere, it is expected to become an important tool in scanning the heavens for pulsating stars, white dwarfs and neutron stars. It may provide evidence for the existence of black holes.

"This very fast data-taking rate is the claim to fame" for the photometer, Bless said.

- more -

Add one--photometer shipped

The simplest and least costly of the Space Telescope instrument packages, it can direct incoming light onto one of about 100 special filters to pick out wanted wavelengths, and has four independent, magnetically-focused light detectors.

Bless said the photometer is the only one out of five telescope instrument packages to be built by a university, and is the first of the packages to be delivered. It came within about 1 percent of its $5 million budget, he said, noting that the cost overrun was because of problems with a commercially purchased power supply unit. The entire project, conceived in 1973 and started in 1977, is federally funded.

The instrument package, about the size of a telephone booth, was built by Space Science and Engineering Center technicians and scientists under the direction of project manager Evan Richards. The heart of the device, the photometer itself, is barely bigger than a breadbox. The rest of the aluminum structure, designed to be light, strong and to compensate for the wide temperature variations in space, holds optical and electronic gear.

It will join three other phone booth-sized instrument packages mounted behind the telescope mirror, and another mounted alongside the mirror. Astronomers will use radio commands to point the telescope and will receive its data by radio.

Two other UW-Madison astronomers also are involved in Space Telescope projects, Blair D. Savage with the high-resolution spectograph and Arthur D. Code with the telescope's wide field camera.

Bless, Code and two other Wisconsin astronomers, Kenneth H. Nordsieck and Christopher M. Anderson, also are involved in a Space Shuttle project designed to measure ultraviolet starlight. That launch is slated in November 1985.

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UIR / RESEARCH NEWS

UNIVERSITY OF WISCONSIN-MADISON

UNIVERSITY-INDUSTRY RESEARCH PROGRAM

WARF Office Building
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Yes - then to MKL for file or Photomedia

UIR SCIENCE WRITING PROGRAM
(Graduate Student Science Writing Division)

Further Information: Robert Bless (608/262-3072) March 14, 1978

Space Science & Engineering

MILLION-DOLLAR UW PAYLOAD TO ORBIT EARTH

by William J. Broad
UW Science Writer

Madison, Wis.--A million-dollar payload from the University of Wisconsin-Madison will be aboard a 10-ton space telescope as it sweeps into earth orbit in 1983. now 1985

Contracts for construction were signed March 1 between the university and the National Aeronautics and Space Administration (NASA).

The device, to be built for NASA by the university's departments of Astronomy and of Space Science and Engineering, will be at the receiving end of the telescope's eight-foot diameter mirror. From a 310-mile-high orbit, it will scan the heavens for rapidly pulsating stars, white dwarfs, neutron stars--and it may even find evidence of black holes.

"The earth's atmosphere obscures many of the most interesting objects in the universe," says astronomer Robert Bless, who designed the instrument. "So we're going to step out beyond it."

-more-

The device, called a high-speed photometer, is one of five instruments that will be on board. The total cost of the instrument may reach one and one-half million dollars, yet it will be little larger than a bread box.

Other instruments will include two electronic cameras and two spectrometers, which break starlight into many wavelengths and then analyze it.

The space telescope, which will be the size of a large city bus, is being built by NASA and will be launched by the Space Shuttle. It will probe deeper into space than has ever before been possible, enabling scientists to solve some of the mysteries of the structure, origin, and evolution of the universe.

The telescope's huge mirror will gather light from some 350 times the volume of space that can now be seen with the largest earth-based telescopes.

Once placed in orbit, the telescope and the photometer will be operated by radio from the ground. However, they will be designed to permit maintenance by a space-suited astronaut and to be retrievable by the Space Shuttle for overhaul. With repairs, the space telescope should last for more than 20 years.

Many universities vied for the photometer contract. But the Wisconsin design was chosen because of its simplicity, says Bless. It has no moving parts that could break down in deep space. Instead, electrically controlled magnetic fields move a tiny electron beam to adjust the instrument.

Withstanding the rigors of space will pay off, says Bless. Observatories below the obscuring veil of the earth's atmosphere

cannot detect ultraviolet wavelengths--a major radiation from stars. In space, however, the photometer will easily pick them up.

And once away from reflected city light in the earth's atmosphere, the photometer can be used to collect information on the brightness of the galactic background.

"There are billions of galaxies out there that we can't see individually, but they each give off light," says Bless. "If you can measure this background light, then we might be able to say something about the overall structure of the universe."

However, the main function of the photometer will be to catch quick changes in a star's brightness, turn them into an electric current, and beam them back to earth.

Pulsating stars already have been detected by ground-based telescopes. But the churning of the earth's atmosphere blurs stars that blink on and off more than once a second. Once past the turbulent atmosphere, however, the photometer can detect rapid fluctuations in brightness--more than 100,000 a second.

Astronomers feel that such improved sensing probably will lead to the discovery of new and possibly unique types of pulsating stars.

"In the past ten or fifteen years," Bless says, "the harder researchers have looked for variability in stars, the more they have found. And we're about to take a very hard look."

These rapid pulsations are now thought to radiate from neutron stars. Only 10 miles wide and so dense that a bit the size of a sand grain would weigh 2,000 tons, these stars probably rotate very rapidly, sending lighthouse-like beams of radiation out into the universe.

From earth, only the ones that blink on and off can be detected. But depending on their mass and speed of rotation, only a minor dimming might occur.

Once out in space, the photometer will be able to look for these tiny variations a hundred times better than earth-based instruments. And this sensitivity may lead not only to better resolution of pulsating stars but to some strange discoveries as well.

For example, some researchers think an object even denser than a neutron star exists. A black hole. It would be so massive and compact that not even light could escape its gravitational pull.

"There has been much speculation about black holes--about how a star near a black hole might have detectable pulsations and wiggles," says Bless. "I'm not sure what we'll find, but now we have the equipment to take a very close look."

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research news

From the University of Wisconsin-Madison / University News and Publications Service, Bascom Hall, Madison 53706 / Telephone (608) 262-3571

Release: Immediately 10/2/79 jhs

(Photo available)

CONTACT: Robert J. Krauss (608) 262-0118/0119

FIRST CLOSE-UP PORTRAIT OF JUPITER'S WEATHER: A MIXTURE OF FAMILIAR AND STRANGE

MADISON--Jupiter's weather has proved unexpectedly familiar in some ways and--as was predictable--very strange in others, says a University of Wisconsin-Madison scientist studying Voyager I's first close-up portrait of the solar system's giant fifth planet.

For four months, Robert J. Krauss of the University's Space Science and Engineering Center has been pouring over 20,000 TV images taken during Voygager I's March fly-by. One of the surprises, he said, was the discovery that many of Jupiter's cloud features have earth-like explanations.

Among the preliminary findings: Jupiter's most distinctive feature -- the Great Red Spot seen first by Galileo more than 300 years ago--may not be permanent.

Funded by NASA's Planetary Programs Office, Krauss and a half-time project assistant, David A. Santek, are among the few Americans looking at Voyager pictures with an eye towards the planet's weather. They are the only U.S. researchers with a system of interlinked computers and television screens, developed at UW-Madison and called McIdas, to analyze the information.

Some of what they have seen looks amazingly like earth, Krauss said.

Thick clouds circle the giant planet in bands not unlike the trade winds which girdle earth's equator. As on earth, there appear to be highs and lows and lines of "thunderstorms." There is lightning--gigantic bolts called "mega-lightning" when they occur on our planet. There are delicate little cloud ripples which on earth are called gravity waves.

- more -

While there are intriguing differences, Krauss said many of the cloud patterns can be explained by basic rules created two decades ago to predict earth weather. "We aren't starting from scratch," he said, in trying to understand the forces which drive Jupiter's atmosphere.

Although Jupiter may appear familiar to earth weathermen, Krauss cautioned that the work is just beginning. "The full value of Voyager isn't going to be felt for another five years," he predicted.

Evidence is already emerging, however, that the Great Red Spot, an orange oval several earths wide, is a gigantic weather phenomenon, a huge whirling air mass with its own internal swirls and eddies. "It's beginning to look more like a hurricane," Krauss said, and like a hurricane it may not last forever. "It may have a long life, but it may not be permanent. It may last for thousands of years, it may last for hundreds," he said.

The unfamiliar features of Jupiter's atmosphere are probably due to a combination of planet size, fast rotation and peculiar chemistry, Krauss said.

Earthbound weather rules appear to break down nearer Jupiter's poles, where the rapid rotation twists the atmosphere into weird patterns with immense coriolis forces--the same forces which make hurricanes and cyclones rotate on our slower-turning earth. "There's very little there that looks familiar," Krauss noted.

Jupiter's different colors, mainly orange, white and blue (plus some brown and faded yellow "if you look real close"), remain unexplained. Krauss is testing a theory, however, that the colors signal different cloud heights.

One of his tests works like a 1950s 3-D movie. The orange clouds in a Voyager image are artificially tinted red and shifted slightly from the blue areas, which are colored green. The experimenter views the picture through plastic eyeglasses, one lens red and the other green, to get a 3-D image. The orange clouds do appear lifted above the blue, but Krauss said more work is needed before deciding that this simplistic stereo picture doesn't violate any laws of physics.

Tentatively, he thinks the white clouds are the highest and that the orange clouds are underneath. The blue areas, he said, may represent scattered light from relatively open sky--blue for the same reason our own clear sky is blue.

Analyzing Voyager's images is a long process. Pictures that appear interesting must be adjusted to eliminate distortion from bad perspectives. Other corrections are needed because Voyager's TV images were warped by Jupiter's strong magnetic field, the same way a home TV picture can be distorted by a magnet held near the screen. Noise and blank spots also have to be touched up. With 640,000 data points per picture, it takes computer help to do the job.

There is plenty of data to work on, Krauss noted. On top of the 20,000 Voyager I pictures taken from January through March are coming another 15,000 taken by Voyager II since April. To round out the view, there is information about other planets available from earlier Pioneer, Mariner or Viking missions to Venus and Mars.

"Ten years ago all we had was the earth," Krauss said. "Since then we've added three more atmospheric laboratories: Mars, Venus and Jupiter." Planetary geologists have also reaped a harvest from Voyager, Krauss noted; they have doubled the number of solar system worlds they can study simply by adding Jupiter's moons.

Another two planetary labs will be added in coming years when both Voyagers reach Saturn and one continues to Uranus. "The next few years are really going to be exciting," Krauss said.

The payoff for earthlings from a study of planetary weather will be a better understanding of our own, Krauss predicted. "There's a very high degree of probability that some of the stuff I'm working on will improve our weather forecasting," he said, but "I can't tell you how."

At least not yet.

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uw news

From the University of Wisconsin-Madison / News Service, Bascom Hall, 500 Lincoln Drive, Madison 53706 / Telephone: 608/262-3571

Release: Immediately 7/17/79 jhs

'PROJECT GREEN THUMB' DEMONSTRATIONS SLATED

MADISON--Wisconsin farmers will get a preview during the next three months of what could become an agricultural information service of the future, University of Wisconsin-Madison weather scientists have announced.

A prototype of the federal Project Green Thumb concept, in which farmers could get weather and agricultural information through their home television sets, will be demonstrated at four county fairs and Wisconsin Farm Progress Days between July 20 and Oct. 11. The demonstrations will be conducted by UW-Madison's Space Science and Engineering Center, which also will survey farmers in an attempt to determine the value of the idea.

"Green Thumb" would use a box hooked into the user's television set and linked by telephone lines to a computer probably located at the county extension agent's office. Up-to-the-minute information could be obtained, upon request, on weather, markets, pests, insecticides, meetings and home economics. The cost would be recovered by some combination of basic charge or user fees.

A pilot program is presently being tested in Kentucky by the National Oceanic and Atmospheric Administration and the U.S. Department of Agriculture and Agriculture-Extension, the federal agencies which must decide the concept's fate.

The Wisconsin demonstrations are scheduled July 20-22 at the Dane County Fair in Madison; Aug. 4-5 at the Racine County Fair, Union Grove; Aug. 25-26, Manitowoc County Fair, Manitowoc; Sept. 15-16, Vernon County Fair, Viroqua; and Oct. 9-11, Wisconsin Farm Progress Days at Montfort in Iowa County.

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research news

From the University of Wisconsin-Madison / University News and Publications Service, Bascom Hall, Madison 53706 / Telephone (608) 262-3571

Release: Immediately 1/28/74

UIR SCIENCE WRITING DIVISION
University-Industry Research Program (608-263-2876)

Further information: Suomi, Krauss, Jet Propulsion Laboratory, Pasadena, California (1-213-354-4025)

By AL ATKINS
UW Science Writer

MADISON, Wis.--On February 5, two University of Wisconsin scientists will discover whether Mariner 10 cameras will penetrate the cloud cover of Venus deep enough to unveil some of the mysteries of the planet's puzzling atmosphere.

Verner E. Suomi and Robert J. Krauss of Wisconsin's Space Science and Engineering Center will begin receiving Venus imaging data from Mariner 10 at the Jet Propulsion Laboratory in Pasadena, Calif.

Their objective is to understand the circulation of the atmosphere of Venus.

The planet will be within camera range from the fast-moving spacecraft--about 10 kilometers per second--for only about 20 minutes. But, because shadows will be long in the region to be photographed, it will be an ideal opportunity to photograph clouds.

"One of our main fears is that the planet has a uniform cloud cover. To get back pieces of 'white paper' would be very disappointing," says Suomi.

Suomi believes that the weather on Venus ought to be very different from that on earth.

"Venus rotates very slowly compared to earth, yet it has a circulation. The Venus atmosphere is very dense--100 times more so than earth--and consists mainly of carbon dioxide. Near the surface, the same pressure exists as is found one kilometer into the ocean on earth."

- more -

The temperatures near the surface are very warm, as hot as molten lead. The clouds may be water vapor, but theories about them are legion.

Venus cloud colors will be identified as differences of fractions of a per cent in color intensities at different wavelengths. Ultraviolet wavelengths are expected to provide some meaningful pictures.

Some 500 data tapes will be brought back to Wisconsin. If Mariner 10 is successful, very good measurements of the general circulation of the planet Venus should be possible.

Several previous space probes have already reached or bypassed Venus, Suomi and Krauss observe, but none of these had imaging systems. Russian probes actually entered the Venus atmosphere. A few were crushed before they reached the surface, but at least one actually touched down, providing data on surface temperature and winds.

The main goal is to try to understand earth's atmosphere--how it redistributes the energy it gets from the sun. The other planets are like giant laboratories. Their atmospheres obey the same physical laws, but operate under different, and often simpler, conditions than those found on earth.

"Venus is much like our tropics in many respects. But it doesn't have seasons or tides, or large amounts of water, which complicate the picture on earth," says Krauss.

"After six years' experience with ATS satellites, Suomi has proved you can learn a lot about atmospheric motions, about the heat budget, about redistribution of heat and momentum in an atmosphere, by looking at the motions of the clouds. So it seemed that we could learn a lot from Venus."

The spacecraft will eventually go past Mercury, another major mission emphasis but one in which the Wisconsin scientists are not as involved.

About 5,000 pictures are expected of Venus; about 2,500 from the even-more-distant Mercury. There is little atmosphere on Mercury, so the planet is of more interest to geologists and astronomers than to meteorologists.

Suomi and Krauss are spending the first months of 1974 at the Jet Propulsion Laboratory preparing for incoming data and then handling the thousands of pictures expected to pour in during and shortly after flyby.

The camera resolution will be high. Even though the pictures are to be taken 3,000 miles from Venus, some of the photos will show details as fine as two to three hundred meters across.

"Later on, in 1977, we'll go off to Jupiter. Here is a vastly different planet," Suomi says.

"It is spinning much more rapidly than earth, once around in nine hours. It is much bigger than the earth. Beyond that, it is heated from the inside. It is sort of a cold star--a half-planet and half-star--and it has all sorts of bands in its atmospheric circulation. These might be 'westerlies' and 'easterlies'. Here we have a planet also very different from earth. If we are unable to explain these differences, then we are going to have a rough time explaining the more subtle differences we note on earth."

Suomi points out that much more data is available for the earth, and that should be a help.

"But we don't have the basic principles understood," he adds. "Additional data from earth may only confuse us. With a better understanding of general principles, the details will make a lot more sense. That's why we're interested in the atmospheres of the planets. They will give us a better understanding of the earth."

Suomi and Krauss are on the imaging team for the Mariner-Jupiter-Saturn mission, for which a spacecraft will be launched in 1977.

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research news

From the University of Wisconsin-Madison / University News and Publications Service, Bascom Hall, Madison 53706 / Telephone (608) 262-3571

Space Sciences Engineering

Release: Immediately 9/28/73

UIR SCIENCE WRITING DIVISION
University-Industry Research Program (608-263-2876)

For further information: Contact Prof. Frank Sechrist (608-262-0778)

By KEITH HAGLUND
UW Science Writer

MADISON, Wis.--Public television station WHA-TV 21 is presenting television's first computerized up-to-the minute weather forecast.

The broadcast, part of a new "Target" current events show, will actually "show" weather happening. A new weather sensing system based on radar, a satellite, and a computer named McIDAS (Man computer Interactive Data Access System) will make the presentation unique.

McIDAS will consolidate weather information and present it as maps of local developments. The computer will initially use standard U.S. Weather Service data and local radar.

Conventional broadcasts depend on facts 6 to 24 hours old, but McIDAS can prepare and deliver information collected as little as 20 minutes beforehand.

McIDAS's speed will allow meteorology professor Frank Sechrist to tell viewers exactly what weather they will experience in the next few hours.

The weather spot is presented daily at about 6:50 p.m., beginning Monday, Oct. 1. Eventually WHA-TV will also offer a five to eight minute morning show and two shorter updates during the day.

The broadcast will become more complete in about a month when the computer is linked to a larger radar facility in Neenah, Wis.

- more -

Then early in 1974 NASA will launch the Synchronous Meteorological Satellite (SMS) which will feed the computer television-like pictures of the hemisphere every 20 minutes. McIDAS will make these into time-lapse movies of cloud pattern movements.

The satellite will orbit 22,000 miles over the equator at the same rate the earth rotates. Thus, it will hover over the same area, continuously taking black-and-white or color pictures of the country.

The SMS signals will be received directly by a bowl-shaped antenna atop the University's Meteorology and Space Science building. This eliminates the time consuming routing of data through the U.S. Weather Service. The UW-Madison system will be the only ground receiving station for the SMS other than the weather service's.

The UW-Madison meteorology department, the Space Science and Engineering Center and WHA-TV cooperated to develop the project over the last year.

The entire program is an experiment in developing a method and format for future cable television systems. Leaders in agriculture, canning, and freezing industries have estimated $150 to $300 million yearly savings could result from such a national weather forecasting system.

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From The University of Wisconsin-Madison / University News and Publications Service, Bascom Hall, Madison 53706 / Telephone: (608) 262-3571

Space Science & Engineering Center

Release: Immediately 6/25/73 ksg/jfn

NEWS BRIEFS FROM THE MADISON CAMPUS

MADISON--Two University of Wisconsin-Madison scientists have been chosen by the National Aeronautics and Space Administration to provide experiments for spacecraft destined for Venus in 1978.

Prof. Verner E. Suomi, director of the UW Space Science and Engineering Center and meteorology Prof.James Weinman will study clouds and energy balance of Venus.

Objective of the mission is to gather detailed information on Venus' atmosphere and clouds. By comparing the atmosphere of Venus, Mars, and Earth, scientists hope to be able to construct a better model of the Earth's atmosphere for use in predicting long-term changes in climate, as well as short term-effects caused by environmental pollution.

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MADISON--The University of Wisconsin-Madison bargaining team and the Memorial Union Labor Organization (MULO) bargaining team jointly announced Monday morning that tentative agreement had been reached on a new contract for the period July 1, 1973, to June 30, 1974.

The contract will be presented by the MULO bargaining team at a union membership meeting Tuesday evening, June 26, at 8 p.m. in 180 Science Hall. The contract is tentatively scheduled for a ratification vote by the membership on Friday, June 29. MULO represents about 450 part-time employees.

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research news

From the University of Wisconsin-Madison / University News and Publications Service, Bascom Hall, Madison 53706 / Telephone (608) 262-3571

Release: Immediately 9/13/72 jb

FOR MORE INFORMATION, PLEASE CALL
TOM STACEY AT (608) 262-0886

MADISON, Wis.--A new breakthrough in medical X-ray transmission and analysis was announced Wednesday by the University of Wisconsin-Madison Space Science and Engineering Center.

The project involves the image enhancement and satellite transmission of X-rays. The focus of the effort is to create a means of transmitting X-rays from geographically remote areas to large medical centers for analysis by expert radiologists. For example, a technician in Point Barrow, Alaska, using an ATS-1 communications satellite, could insert an X-ray into a facsimile transceiver and in a few minutes an enhanced reproduction of it could be printed at University Hospitals in Madison.

The diagnosis of the X-ray could be sent back to Alaska within two hours. This would allow a physician or paramedic to have expert consultation, often required because of the complexity of the X-ray.

Previously, this type of consultation could only be done by mail.

The enhancement technique has enabled medical personnel to decrease the time needed for diagnosis of bone disorders. Enhancement involves the use of a high speed computer to eliminate any unnecessary "noise" from the image so that the essential elements of it are clearly emphasized.

The project is headed by Drs. Delbert D. Smith; John M. Benson, who was responsible for the enhancement computer program; and John M. Jurist, who is handling the medical analysis area.

- more -

Dr. Smith noted that this process opens a whole new spectrum for medical aid to people living in sparsely settled areas. He stated:

"For the first time, a method for fast, effective, and efficient analysis of X-rays can be available to the public. Not only can the analysis be accomplished in just a few hours, but because of the enhancement by a computer it provides for better diagnosis."

The researchers described the case of the woman who complained of hip pains for near 18 months. Repeated X-rays showed no evidence of a break or disorder of any sort. Finally a fine stress fracture was discovered when an old X-ray was enhanced.

Prof. Verner E. Suomi, center director, referred to the advancement as "an indication that scientific advancements funded by public agencies are paying the dividends to those who for so long have footed the bill, the general public."

The project was funded by the National Library of Medicine.

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uw news

From The University of Wisconsin-Madison / University News and Publications Service, Bascom Hall, Madison 53706 / Telephone: (608) 262-3571

Space Science Engineering Center

Release: Immediately 6/2/72 keh

MADISON--Dr. Krishan L. Sondhi, director of the Indian Satellite Instructional Television Experiment, will visit the Space Science and Engineering Center at the University of Wisconsin-Madison next week.

Dr. Sondhi will present a progress report on the experiment for interested faculty members at 11 a.m. Wednesday in 148 Space Science.

The experiment is a joint effort of the Indian and United States governments. It calls for the U.S. launching of an educational satellite in 1973 which will be positioned over India in 1974.

The satellite, supplemented with three ground stations, will broadcast instructional programs in seven languages to 5,000 Indian villages. Programs will attempt to persuade villagers to increase agricultural productivity, to promote general education, and to disseminate information on family planning.

"The experiment will test the hypothesis that community viewing of instructional television can aid national development," according to Dr. Delbert D. Smith, director of the UW center.

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uw news

From The University of Wisconsin News and Publications Service, Bascom Hall, Madison 53706 • Telephone: (608) 262-3571

Release: Immediately 9/8/71 mm

MADISON--Is the medium the message with satellite telecommunication?

Prof. Delbert D. Smith, director of the University of Wisconsin-Madison EDSAT Center, thinks so. The center is a multidisciplinary facility created to research and promote educational and social uses of satellite technology.

EDSAT stands for Educational Diffusion and Social Applications of Satellite Telecommunication.

"Even though the medium is not considered by the majority of scholars in the field of communications to be the message, it is becoming increasingly clear that the medium has a significant number of specialized problems that must be dealt with if the communication satellite is to be used to its full potential," Dr. Smith said.

Some of the specialized problems are the development of detailed international treaties and national laws dealing with satellites; powerful commercial interests involved with international telecommunication; roles of international organizations such as the International Telecommunication Union; and questions about frequency allocations.

"Questions will arise as to the propaganda value of particular programming and whether the launching state of the satellite used to transmit the signal should be held liable for the content of the programs which it allows to be broadcast," Smith explained.

"Whether this turns out to be true or not, it remains that the legal and political scholar needs to be informed of the issues if he is to intelligently guide the development of the law."

- more -

Add one--Medium message

EDSAT Center recently published an annotated bibliography titled "Legal and Political Aspects of Satellite Telecommunication." It costs $2 and can be ordered by writing the EDSAT Center, Space Science and Engineering Center, 1225 W. Dayton st., Madison 53706.

"The potential use of satellites for telecommunication is enormous, and the technical barriers to the achievement of this potential are rapidly disappearing," Smith said.

"However, it is entirely possible that political and legal barriers rather than technological considerations will ultimately shape the utilization of satellite systems."

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uw news

From The University of Wisconsin News and Publications Service, Bascom Hall, Madison 53706 • Telephone: (608) 262-3571

Space Science & Engineering Center

Release:

Immediately

3/23/71 rf

MADISON--The nation's fight against ecological and environmental pollution will be demonstrated in exhibits at the big Engineering-Science-Industry Exposition at the University of Wisconsin College of Engineering Friday through Sunday.

The displays will be among more than 100 set up by Wisconsin student-engineers and scientists and by the state's and the nation's largest industries and government agencies, housed in all engineering buildings on the Madison campus.

Among the displays will be one by the UW Space Science and Engineering Center Air Pollution Program, including a model of the ATS satellite used to improve weather forecasting and assist in studying air pollution.

A sand-box model of a one-wire Project Sanguine antenna will demonstrate problems of induced voltages in nearby power lines and fences. Tom Bartel, electrical engineering student from Valders (Manitowoc County), hopes to get viewer reaction to such effects as electric light flicker caused by these induced voltages.

The UW student chapter of the Society of Automotive Engineers will have several exhibits demonstrating steps being taken to control fuel emissions from cars which pollute the air.

One exhibit, to be displayed outside of the Engineering Building, is a crusher used in disposing of junk cars which have been removed from the landscape.

Another exhibit of interest to those concerned with environmental problems will be that of a soap company which produces all-purpose cleaners, laundry detergents, and mild soaps that are 100 per cent phosphate free.

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uw news

From The University of Wisconsin News and Publications Service, Bascom Hall, Madison 53706 • Telephone: (608) 262-3571

Release: Immediately 1/23/70 j1

UIR Science Writing Division (262-5984)

UW Space Science and Engineering Center, Bob Wollersheim, Project Manager (262-5938)

VANDENBERG AIR FORCE BASE, Calif.--A weather satellite with an infra-red sensing device designed and built by University of Wisconsin scientists went into orbit from this Pacific coast launching site Friday.

The device is the newest in what is now a long series of satellite reseach instruments designed and developed at Wisconsin's Space Science and Engineering Center. It is called a flat plate radiometer subsystem.

The radiometer is designed to measure the earth's solar radiation budget. This budget describes the energy exchange between earth and space, an exchange that is the key to weather research because pole-to-equator differences in atmospheric energy initiate the global atmospheric and oceanic circulations and trigger the events we call weather.

The data will be relayed to earth via a conventional radio link. It will be used to make maps showing the details of the earth's atmospheric energy budget.

The satellite carried about 10 other instrument packages designed at other research centers to make additional atmospheric and oceanic observations.

The satellite was launched by the National Aeronautics and Space Administration and the spacecraft was built by RCA.

- more -

Constructed under the leadership of Prof. Robert J. Parent, associate director of the Wisconsin Space Science and Engineering Center, the instrument weighs only five and one-half pounds and requires a single watt of electrical power. The package is constructed of aluminum honeycomb with aluminum and magnesium fittings.

Other scientists helping to design the instrument for the TIROS M satellite include Robert P. Wollersheim, project manager; Robert M. Dombroski, mechanical and thermal engineer, and Kenneth R. Walker, senior technician, all of the space science center.

The project is part of a continuing weather research program using space vehicles. It is supported by the Environmental Science Services Administration of the U.S. Department of Commerce.

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uw news

From The University of Wisconsin News and Publications Service, Bascom Hall, Madison 53706 • Telephone: (608) 262-3571

Release: Immediately 12/23/69 vh

MADISON--The Federal government has awarded a plaque to the University of Wisconsin in recognition of outstanding contributions to the success of a large science project in the tropical Atlantic area.

The award, given to the Space Science and Engineering Center by the Environmental Science Services Administration, honors three separate center efforts in the Barbados Oceanographic and Meteorological Experiment (BOMEX).

Kirby J. Hanson, executive director of the center, explained that the BOMEX program, in which more than 1,000 scientists took part, was aimed at measuring the exchange of energy and water vapor between the ocean and atmosphere in the tropics.

Wisconsin's contributions included the following: a design, never before attempted, for a wind sensing device working from a tethered balloon; conducting of an aircraft radiation measurement program; and conducting of a program to read out weather satellites directly from a field station on Barbados. This direct reading resulted in pictures of cloud cover over the tropical Atlantic area.

The plaque from the federal agency to the Madison campus science center is on display in the lobby of the UW Meteorology and Space Science Bldg., 1225 W. Dayton st.

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uw news

From The University of Wisconsin News and Publications Service, Bascom Hall, Madison 53706 • Telephone: (608) 262-3571

Release: **Immediately** **12/9/69**

By BRUCE INGERSOLL

CHICAGO--From over the Atlantic came a series of bleeps--low-powered radio signals to a ship adrift along the Equator.

The bleep-bleeping came from a new device known as the WINDAV, developed at the University of Wisconsin's Space Science and Engineering Center in Madison.

WINDAV stands for wind (WIN) direction (D) and (A) velocity (V), UW electrical engineer Theodore Bernstein explained at the National Electronics Conference meeting here this week.

This device is a mechanical hybrid, created by crossing the farmer's weather vane with the weather man's anemometer (wind speedometer). Its innards are encased in an aluminum cylinder only slightly larger than a woman's lipstick.

WINDAV was designed for use with balloons tethered by thin cables to ocean-going research vessels, Bernstein said.

The anemometer part of the device has three protruding spokes. These have wind cups at their tips and spin in the breeze. The stronger the wind, the faster they revolve.

The revolving anemometer is mounted on a triangular frame. This triangle is attached to the balloon cable so it is free to swing like a weather vane and indicate the wind's direction, Bernstein told his colleagues.

- more -

It is the detection of wind direction in relation to the earth's magnetic field that makes WINDAV unique. The radio bleep-bleeping relays the information on wind to ship-board scientists below.

The bleeps are produced by a Sony magnetodiode, a small transistor-like device which uses less than one-twentieth as much battery power as a flashlight.

Bernstein and Joseph G. Miller, a UW specialist on instrumentation, developed WINDAV at a cost of $37,000 for the federal Environmental Science Services Administration's $22.5-million BOMEX project.

The Barbados Oceanographic and Meteorological Experiment (BOMEX) was conducted last May, June, and July east of Barbados to learn more about the mysterious interactions between the tropical sea and the air.

It required an armada of 10 ships, 24 airplanes, several earth-orbiting satellites, and a dozen buoys all equipped with sophisticated instruments. Balloons were tethered to four of these ships, keeping the WINDAVs aloft for round-the-clock readings on wind speed and direction.

The WINDAV-supplied data will be used to create computer models of global weather patterns, Bernstein said. It is the hope of meteorologists that a "world weather watch" system can be developed within the next decade, using the models to predict the weather for any spot in the world two weeks in advance.

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University of Wisconsin Space Programs

With the opening of the Space Age in the late 1950s, the University of Wisconsin, in cooperation with the National Aeronautics and Space Administration, established several programs of research on the Madison campus to be forwarded through space flight activities. As extensions or additions to these originals, space programs are now being vigorously pursued by Wisconsin scientists in astronomy, meteorology, engineering and physics.

Space Astronomy

Washburn Observatory experimenters, among the first to recognize the possibilities in space flight, have planned and designed research instruments which, carried above the earth's obscuring atmosphere, could reveal new knowledge of young hot stars--and possibly even the key to the orgin and development of the universe--through observations of the ultraviolet light which such stars emit. In the past three years their efforts have yielded data gained with instruments mounted on rockets and on an experimental X15 plane. Six such rockets have been launched to date, all from Northern Hemisphere sites, and more are planned to be sent aloft from both Northern and Southern Hemisphere launching grounds.

In one of the most ambitious of space astronomy ventures, the Wisconsin scientists are today nearing the countdown for a second orbiting astronomical observatory. A first OAO, launched at Cape Kennedy in 1966, defeated Wisconsin research attempts when a power failure developed. The largest, heaviest, and most automated scientific satellite ever undertaken by the U.S., the "flying" observatory due this fall will carry 11 telescopes (7 for Wisconsin) and a wealth of electronic equipment as it goes into circular orbit some 480 miles above the earth.

Space Physics

In Wisconsin's space physics explorations, the experimenters are concerned with learning more about x-rays, gamma rays, and the solar wind. It is known that some celestial objects, as yet unidentified, emit large amounts of x-radiation.

- more -

On two occasions, August, 1967, and September, 1968, our physicists, sharing rocket space with our astronomers, have sent instruments aloft which may reveal how x-rays originate and establish with certainty how general is the phenomenon of enormous x-ray output from stellar sources.

A satellite x-ray experiment for Wisconsin is now scheduled for flight in 1970. It will be flown on a Saturn rocket as part of NASA's Apollo Application program. Also scheduled in the x-ray space investigations is a Tomahawk rocket to be launched from Wallops Island, Va., early next year.

And still another space physics instrument will be launched, this time to learn more about the solar wind. Following discovery of the wind, one of our scientists set about developing a detector for deuterium, the heavy isotope of hydrogen found in that wind. This instrument, now completed, has been approved for flight on two of NASA's interplanetary Monitoring Platform Satellites.

Space Meteorology

No examination of space science is complete without a salute to the men in the department of meteorology and the Space Science and Engineering Center and to the milestones they have laid down. Beginning with the launch of Explorer VII in 1959 and continuing with a series of Tiros satellites, this group has obtained the heat budget of the earth, has learned that the solar energy absorbed in tropical regions is considerably higher than previous estimates, and that the atmosphere and ocean currents redistribute this excess heat through the mechanism of weather.

With cameras mounted on a geosynchronous satellite, launched in 1966, they have photographed the entire Pacific hemisphere continuously from space and have viewed the tropics and associated weather motions as a single entity.

Launched the following year, another Applications Technology Satellite carried cameras for meteorology which are capable of photographing the earth in full color. The photographs they have provided, as opposed to non-color views, make it far easier to distinguish land from clouds, sea, and muddy river discharge. Out of of the experiment, rough estimates of cloud altitudes were made possible,

measurements of cloud motions were obtained, and moving pictures of severe weather situations were accomplished. From such pictures it is possible to pinpoint widely separated wind currents which, in combination, created the severe storm.

Because the geosynchronous platform permits continuous observations of the weather below, a whole series of new experiments concerned with small scale motions of the atmosphere, for instance, thunderstorms and convective cloud organization, is seen for the future.

Astronaut

In August, 1967, the National Aeronautics and Space Administration named a 30-year-old University of Wisconsin astronomer to the ranks of American spacemen. Astronaut Robert Parker was due for promotion to the rank of associate professor on Wisconsin's Washburn Observatory staff when the naming took place. His five years of experience on the Madison campus had included teaching, research and supervision of Washburn's major research facility, the Pine Bluff country observatory.

Parker faced a long period of training before any flights for NASA would be attempted, but it seemed likely then and seems likely now that he will ride an Apollo or post-Apollo in search of new knowledge of the universe. And it is not outside the realm of possibility that he will carry out experiments identified with his own campus. Though Parker has not been directly associated with Wisconsin's space astronomy efforts, he is thoroughly familiar with the program and its aims.

As American space exploration continues, research institutions will be applying to NASA to have their experiments flown in manned satellites, Parker predicted, "and if Wisconsin applications are accepted, I might very well be running one for Washburn."

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uw news

From The University of Wisconsin News and Publications Service, Bascom Hall, Madison 53706 • Telephone: (608) 262-3571

Release: Immediately 4/29/69 rf

MADISON--Several hundred engineers and industrialists, many of them University of Wisconsin graduates, will view a special exhibit at the new Space Sciences and Engineering Center in Madison Friday.

They will join faculty and students in celebrating the University's 21st annual Engineers' Day.

The exhibit will be open from 1:30 to 3:30 p.m. in the center at 1225 W. Dayton.

Staff members will explain and demonstrate several novel devices and equipment in solving satellite, meteorological, telemetry, and data-processing and conversion problems.

Climax of the celebration will be the annual Engineers' Day dinner at 6:15 p.m. in Wisconsin Union Great Hall at which eight outstanding leaders in engineering, industry, and government service--seven of them UW graduates--will receive distinguished service citations.

Vice Pres. Robert L. Clodius of the University, and Engineering Dean Kurt F. Wendt will present the citations.

The annual Benjamin Smith Reynolds Award of $1,000 for Excellence in Teaching of Future Engineers will be presented to a UW faculty member by Gordon R. Walker, Racine, member of the University Board of Regents.

- more -

Add one--Exhibit

The University Singers, directed by Prof. Donald L. Neuen of the School of Music, will present the musical program. Prof. David R. Otis, mechanical engineering, will give the invocation, and Prof. Camden A. Coberly, chemical engineering, will preside.

Citations will be presented to William V. Arvold jr., president of Wausau Paper Mills Co.; Conrad H. Hoeppner, president of Industrial Electronics Corp., Satellite Beach, Fla.; Einar A. Jacobsen, president of Jacobsen Manufacturing Co., Racine; Daniel E. Krause, director of Gray Iron Research Institute Inc., Columbus, Ohio; Luna B. Leopold, senior research hydrologist of the U.S. Geological Survey, Washington, D.C.;

Frederick D. Mackie, president of the Madison Gas and Electric Co.; James F. Mathis, director and vice president, Esso Research and Engineering Co., Toronto, Ont., Canada; and Allan L. McKay, president of Giddings and Lewis Machine Tool Co., Fond du Lac.

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uw news

From The University of Wisconsin News and Publications Service, Bascom Hall, Madison 53706 • Telephone: (608) 262-3571

Release:

Immediately 3/6/69 jb

MADISON--Prof. William P. Glade, University of Wisconsin Graduate School of Business in Madison, is the author of a new book showing the evolution of economic structures in the South American countries.

Published by Van Nostrand Co. Inc., Princeton, N.J., the book is titled "The Latin American Economies: A Study of Their Institutional Evolution."

- o -

MADISON--The chairman of the University of Wisconsin department of Hebrew and Semitic studies, Prof. Menahem Mansoor, is the new president of the midwest branch of the Society of Biblical Literature.

The branch has over 800 members in the U.S.A. and Canada.

- o -

MADISON--An exhibit of space satellite instrumentation and a view of the earth's weather in motion as seen from outer space are two of the many displays at an open house on the Madison campus of the University of Wisconsin Saturday.

From 1 to 5 p.m. the UW department of meteorology and space science and the Engineering Center will be open to guests. The site will be the new 15-story research facility, the Meteorology and Space Science Building, at the corner of W. Dayton and N. Orchard streets.

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uw news

From The University of Wisconsin News and Publications Service, Bascom Hall, Madison 53706 • Telephone: (608) 262-3571

Release: Immediately 1/6/69 vh

MADISON--The ways in which space research discoveries and engineering inventions are being applied to the solving of major medical problems will be told in joint lectures scheduled for 3:30 p.m. Thursday, Jan. 16, at the University of Wisconsin.

Open to the public, the talks in 107 Psychology Building are part of a continuing series in a Space Colloquium presented by the University's Space Science and Engineering Center.

David Bendersky, Midwest Research Institute, Kansas City, Mo., the first speaker, will discuss the biomedical application team program of the National Aeronautics and Space Administration. Some 30 medical schools including Wisconsin's are participating in the program designed particularly to encourage the application of space technology to medical and biological problems.

The second speaker, Dr. Stuart Updike of University Hospitals, Madison, will tell of NASA contributions to biomedical engineering and how some of these have influenced his own research efforts.

Updike has developed a patient monitoring system and is working on chemical transducers for use in internal body measurements. Both of these research activities have borrowed from NASA technology.

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uw news

From The University of Wisconsin News and Publications Service, Bascom Hall, Madison 53706 • Telephone: (608) 262-3571

Release: Immediately 10/10/69 bi

UIR Science Writing Division (262-5984)
Contact Bruce Ingersoll

MADISON, Wis.--The University of Wisconsin's $4.5 million Meteorology and Space Science Building at 1225 W. Dayton st., Madison, will be dedicated at 8 p.m. Monday (October 20).

Gov. Warren P. Knowles and other governmental and academic officials will participate in the ceremony.

A symposium on the "Future of the Atmosphere" will be held Tuesday and Wednesday in the Wisconsin Center, 702 Langdon st., in conjunction with the dedication. The American Meteorological Society (AMS) is sponsoring the symposium.

On Monday, "The Application of Space Technology to Human Needs" will be considered in a 2 p.m. colloquium in the Wisconsin Center. It is being organized by the UW Space Science and Engineering Center (SSEC) to mark the building's official opening.

The new facility, rising 15 stories over the southwest corner of the campus, brings under one roof the department of meteorology and SSEC as well as the Marine Studies Center, Space Medicine Laboratory, and Center for Climatic Research.

For the professors, research assistants, technicians, and secretaries who occupied the clean-lined building last fall, it is a far cry from the makeshift quarters they once had--an old barn, a one-time carpet store, some rooms over a dentist's office, and three other inadequate places.

- more -

"The meteorology department came essentially out of the slums," said Prof. Eberhard Wahl, chairman of the building committee. "We had senior professors working in rooms without windows, and they couldn't even tell if it was raining. Meteorologists are supposed to know something about the weather outside."

Functional in design, the building has flexibility built in to meet the changing needs of researchers and scholars in rapidly expanding Space Age fields. The scope of their studies and experiments promises to be as limitless as outer space itself.

This tower of offices, reading rooms, labs, and seminar rooms constitutes an "idea" factory. It is a hub for futuristic activities.

While experts in synoptics are working to improve weather forecasting techniques, their colleagues in space science are designing, building, and testing intricate components of weather satellites.

Other scientists are investigating the vagaries of tropical, Arctic, and Antarctic weather, the subtleties of micrometeorology (weather in the "boundary layer" up to 3,000 feet), as well as cloud physics and the energetics and dynamics of the atmosphere.

In a basement laboratory, climatologists are using radiocarbon-dating equipment to determine the age of prehistoric remnants of vegetation, thereby amassing bits of information to form a picture of major climatic changes in the past 12,000 years. With that historical picture, they hope to predict future trends accurately.

Local meteorological observations are being taken by sensitive gear in a penthouse, two sides of which are all glass, while world-wide data are being received 24 hours a day via teletype and facsimile circuits.

Add two--dedication

No research center is complete nowadays without a computer. The Meteorology and Space Science Building has one that is tied in with the nearby UW Computing Center. These facilities are being used to construct theoretical models of the atmosphere and of continental and global weather patterns, among other things.

Funding for the high-rise building was shared by the State of Wisconsin, National Science Foundation, and the National Aeronautics and Space Administration. Representatives of all three will participate in dedicating the building to "an understanding of man's physical environment and its use for the benefit of mankind."

Dr. Robert V. Dahlstrom, Manitowoc, will represent the UW Board of Regents and Vice-Pres. Robert Taylor, the University administration, at the dedication. Dr. Verner E. Suomi, professor of meteorology and SSEC director, will speak on behalf of his center and the department of meteorology.

The department was established by Prof. Reid A. Bryson in 1948. After nearly a decade of slow growth, it suddenly mushroomed to become one of the largest in the country. It now has 73 graduate students and about 55 undergraduate majors, and ranks first in the nation in Ph.D.'s awarded in the last few years.

The AMS symposium will be divided into four sessions: past atmospheres (Tuesday morning), present atmosphere (Tuesday afternoon), the future of the atmosphere (Wednesday morning), and the future of the atmospheric sciences (Wednesday afternoon). Reservations are being handled by Dr. Katharina Lettau of the meteorology department.

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uw news

From The University of Wisconsin News and Publications Service, Bascom Hall, Madison 53706 • Telephone: (608) 262-3571

Release: Immediately 12/13/68

By LYNN BEHNKE

MADISON--Like scattered pockets of cold air joining for the first week of winter weather, the University of Wisconsin's department of meteorology is abandoning a half dozen locations about campus to unite in one new building.

More than 100 professors, research assistants, technicians, and administrative staff members from the department are moving into the new Meteorology and Space Science Building at 1225 W. Dayton.

Mrs. Marie Riggs, department secretary for 13 years, has been preparing for the transition since August. Sorting departmental files first opened 20 years ago is not an afternoon's diversion.

Frank Sechrist, assistant professor of meteorology and a member of the team headed by Prof. Eberhard Wahl in coordinating the move, may not worry about losing a favorite pipe in the shuffle between buildings, but the students in Atmospheric Science II will continue to expect him in class, on time, and with any lecture notes he may have planned to use.

The problems Mrs. Riggs and Prof. Sechrist encounter while moving from the labyrinthine fourth floor of Science Hall are representative as the department of meteorology, chaired by Prof. Lyle H. Horn, completes the move into the Meteorology and Space Science Building.

- more -

The building stands at the corner of West Dayton and Orchard Streets. Rising 15 stories, gingerly spread at the top like a towering cumulus, the $4.5 million structure will be shared by the department of meteorology and the Space Science and Engineering Center, an offspring of the former. SSEC will occupy the 1st seven floors, including the basement, of the building's office space and research facilities.

This allocation of its space reflects in part the funding of the building. The State provided approximately $1.6 million toward construction of the building. The remainder was contributed by the National Aeronautics and Space Administration and the National Science Foundation, who contributed about $1.7 million and $1.2 million, respectively.

Classes have been running smoothly within the department despite the activity of moving. Though the new research complex will not house classroom facilities -- classes will be continued on other parts of the campus -- meteorology students are enthusiastic about the move.

"Students see only conveniences in the move," Sechrist said, burdening his cluttered office in Science Hall with an armful of dusty boxes from some other cluttered office . "Graduate students will benefit from the expanded office space and research facilities. Undergraduates will have room to expand and complete model weather stations."

Prof. Reid A. Bryson anticipates the conveniences of expanded facilities as much as his students do. To him the fact that the members of the meteorology department will share one common location is even more promising, however. "A staff working close together comprises a kind of critical mass," Bryson explained. "One professor stimulates the thinking of his colleagues and the entire department shares the reaction."

Prof. Bryson can be found on the 13th floor of the new building. He is as well qualified as anyone to discuss the dynamics of Wisconsin's department of meteorology. Twenty years ago Bryson was Wisconsin's department of meteorology.

Reid Bryson first came to the Madison campus in 1946 as an assistant professor of geology and meteorology. He received his Ph.D. in meteorology from the University of Chicago in 1948. In the same year, Wisconsin's department of meteorology was established under his leadership.

That July, Bryson doubled the department's staff by recruiting a colleague from Chicago's meteorology department, offering to drive the recruit and his family to Madison in his own car. On the way from Chicago, Bryson gambled the credentials of Wisconsin's shiny-new department by assuring his passengers the rainstorm they had entered would break at the Wisconsin state line.

It did. The Verner Suomi family settled in Madison and Prof. Suomi has remained with the University's meteorology department. Currently he is director of the Space Science and Engineering Center.

The meteorology department slowly continued to attract teachers and students -- slowly until the late fifties.

"From about 1957 to 1965 the department just about doubled every year," Bryson recalled. "Today a third of the nation's Ph.D.'s and M.A.'s in meteorology graduate from the University of Wisconsin. One quarter of the country's bachelor degrees in meteorology are earned here."

Meanwhile, the three rooms available to the department in 1948 had been succeeded by six buildings.

But students and professors both have learned that growth figures fail as a reliable measure of a department's vitality. A truer scale might examine achievements attending diverse interests.

"The department is not here to train weathermen," Bryson began. "We are concerned with understanding our environment. In the meteorology department that concern has led to registering the earth's heat loss with orbiting observation systems and extended to an examination of the oceans' deepest currents.

"It has prompted a revitalized research program in long-range weather forecasting and urged the development of methods enabling us to reconstruct climatic conditions contemporary with field data centuries old."

Bryson is not concerned with displaying the department's laurels. He reverts to the notion of "critical mass" and continues:

"Specialization could have endangered the department, especially being physically fragmented as it has been the last few years. Having the department in one building again reduces that danger, and that is important. The interaction between our members which hastened our growth a decade ago can be expected to recur."

Interaction between the department of meteorology and other departments will continue as well. The Space Science and Engineering Center evolved as a focus for University-wide effort in space science and technology. The department of meteorology has participated in multi-disciplinary projects since its inception.

"Much of the department's strength can be attributed to its history of active collaboration with departments ranging from the department of anthropology to the department of zoology," Bryson attests.

Bryson is also conscious of the administration's role in developing the department of meteorology. "Wisconsin is a place where ideas are given a hearing; it is a wide open community of scholars. The administration has backed us in diverse projects since the department first began 20 years ago."

Today Wisconsin offers its students one of the best meteorology departments in the nation. "Teaching is still our most important job," Prof. Bryson stated. "The department's reputation will stand independently of its research.

"Nearly one-quarter of the University's undergrads take meteorology courses sometime during their four years here. We are trying to give them the best liberal arts undergraduate teaching we can, and if you are interested in a strong university, you see the primary dividend of growth in its attraction of money and staff to teach more students better."

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uw news

From The University of Wisconsin News and Publications Service, Bascom Hall, Madison 53706 • Telephone: (608) 262-3571

Release: Immediately 10/11/68 vh

MADISON--Robert J. Parent, associate director of the University of Wisconsin Space Science and Engineering Center, has been invited to witness Friday's scheduled launching of the Apollo VII manned spacecraft.

Parent, an electrical engineering professor on the Madison campus, has been identified with Wisconsin space research since 1959. He will be among a distinguished number of scientists and government officials invited by the National Aeronautics and Space Administration to witness the historic event at Cape Kennedy.

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uw news

From The University of Wisconsin News and Publications Service, Bascom Hall, Madison 53706 • Telephone: (608) 262-3571

Release: Immediately 9/27/68 vh

MADISON--A last chance to view significant objects from University of Wisconsin experiments in space is offered to the public in a display at the Madison Public Library, 201 W. Mifflin St.

The month-long exhibition installed in the second floor gallery will run to the end of September.

Contributions from Wisconsin's Space Science and Engineering Center include large color photographs of clouds and cloud motions and views of the satellite which made them possible. The ATS-C, launched from Cape Kennedy in November, 1967, accomplished the first color photos of clouds and earth simultaneously transmitted from a synchronous satellite.

A one-half scale model of the experimental "package" for the orbiting astronomical observatory launched from Cape Kennedy in 1966 is among items from the Space Astronomy Laboratory. The OAO study of young hot stars through the ultra-violet light which they emit is one of Wisconsin's most ambitious space ventures and will be furthered with a second OAO launch next month. Developments in the OAO program and similar star studies by means of rockets and an X15 experimental plane are also featured.

One of two satellites built to study energetic cosmic gamma rays is among contributions from the space physics group in the Madison campus physics department. Its twin was launched into orbit from Cape Kennedy in April 1961. Photographs showing other satellite research efforts identified with the space physics group are also on view.

The exhibit is open to the public during all open hours for the library: 9 a.m. to 9 p.m., Monday through Friday; 9 a.m. to 5:30 p.m. Saturday.

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uw news

From The University of Wisconsin News and Publications Service, Bascom Hall, Madison 53706 • Telephone: (608) 262-3571

Release: Immediately 1/31/68

UIR Science Writing Division (262-5984)

By JOHN WOLF

SAN FRANCISCO--(For Release PM's Thursday, Feb. 1)--Extensive seasonal cloud patterns over the entire earth can be shown in composite pictures produced from day-to-day satellite photographs, a University of Wisconsin meteorologist said Thursday.

Speaking at a national gathering of weather experts in San Francisco, graduate student Jack Kornfield described how he and fellow researcher Arthur F. Hasler use photographs from the ATS-1 satellite to study the planet's cloud cover over long periods of time.

ATS-1 has been in stationary orbit over Hawaii since December 1966. The satellite contains a camera designed by scientists and engineers at Wisconsin's Space Science and Engineering Center. The camera continues to send black and white pictures of cloud cover over the Pacific hemisphere once every 30 minutes during daylight. The pictures are studied by the space center's data analysis team, including Kornfield and Hasler.

Many of the cloud patterns seen in the composite pictures have never been noticed before because they occur over oceans, where ground observation sites are obviously limited. Some patterns, however, are well known, such as the seasonal alternation of monsoon clouds and clear skies over India.

-more-

Add one--cloud pictures

To produce the composite pictures, photographic film is exposed equally to a series of satellite pictures taken of the same geographical area at the same time each day for several days.

The resulting composite photographs provide a glimpse of the entire earth's "average" cloud cover for selected periods of time as well as information about the distribution of snow, ice and vegetation.

A composite of cloud pictures taken over the Pacific in June last year shows a distinct cloud band north of and parallel to the cloud-free equator. South of the equator, there is a storm track angling southeast from the East Indies to Antarctica.

The data analysis team has also produced composite photographs of the northern hemisphere from pictures taken by the ESSA satellite last year. These pictures show the Indian monsoonal changes as well as a large cloud-free area over the western Atlantic Ocean.

In the February 1967 ESSA composite, major mountain ranges are marked by their snow cover. The Greenland ice cap stands out brightly in the July composite.

Another method of analyzing ATS-1 data consists of making time-lapse movies from single satellite frames.

Kornfield and Hasler are also studying pictures from ATS-3, which has a Wisconsin-conceived color camera on board.

Dave Cadle is chief photographer for all of these studies.

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uw news

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Release: Immediately 11/1/67

UIR Science Writing Division (262-5984)

By JOHN WOLF

MADISON--Full-color pictures of half the earth will be produced by a University of Wisconsin experiment aboard the Applications Technology Satellite (ATS-C), due to be launched Friday (Nov. 3) at Cape Kennedy.

ATS-C will be maneuvered into a stationary orbit 22,300 miles above the Atlantic Ocean near Brazil. From this orbit, a color camera on ATS-C will photograph changing cloud patterns over the Atlantic and surrounding continents.

The color camera experiment was conceived by scientists Verner E. Suomi and Robert J. Parent of UW's Space Science and Engineering Center. It is a follow-up to the Wisconsin experiment aboard the ATS-1 satellite which produces valuable and spectacular black and white photos of cloud patterns over the Pacific Ocean. The camera aboard ATS-1 is still sending pictures after nearly eleven months in orbit.

Parent, an electrical engineer, will be on hand at Cape Kennedy for the launching of ATS-C by an Atlas-Agena rocket. If successful, ATS-C will become ATS-3.

Suomi, a meteorologist, will use the color photos to study the motion of air masses -- especially in tropical areas of the Atlantic --as indicated by the movement of cloud systems.

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The color camera will enable Suomi and many other meteorologists to determine relative cloud heights. For example, high clouds at the boundary between daylight and night will appear red to the ATS-C camera, while lower clouds will appear darker.

If the camera on ATS-C produces enough color contrast, scientists should be able to locate the Gulf Stream flowing through the Gulf of Mexico and Atlantic Ocean because this current has a slightly different shade of green than the surrounding oceanic waters. Information on continental vegetation may also result from the Wisconsin color camera experiment.

Each color photograph will be a composite of red, green and blue elements -- similar to the way color pictures are created in newspapers.

The area of the earth that can be seen by the camera -- a complete disc -- will be scanned in 2.2 -mile-wide bands extending east to west from horizon to horizon. When 2400 adjoining bands have been scanned by the camera, one picture of the entire hemisphere will be complete. Each picture requires 25 minutes to expose.

The color camera on ATS-C is only the second announced color camera capable of photographing half the earth at a time. The U.S. DODGE satellite returned a color photo of the earth as a disc from a height of 18,100 miles in September. Parent and Suomi hope for higher quality photos than the one made by DODGE.

The Applications Technology Satellite program represents a major effort by the National Aeronautics and Space Administration to obtain an economic return on the U.S. investment in space research.

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uw news

From The University of Wisconsin News and Publications Service, Bascom Hall, Madison 53706 • Telephone: (608) 262-3571

Release: Immediately

8/15/66 jw

UIR Science Writing Division (262-5984)

MADISON, Wis.--A physical facility to coordinate projects related to space research at the University of Wisconsin will begin operations this fall when the Space Science and Engineering Center moves into quarters at 601 East Main Street in Madison.

The space center is presently supporting eight UW projects totaling about $1.5 million in contracts. The center is under the direction of meteorology professor Verner Suomi, who developed instruments for several U.S. TIROS and Explorer satellites.

Begun a year ago as part of the Graduate School, the space center currently is housed in the meteorology department in Science Hall. Meteorology professor C. E. Anderson, the center's assistant director, noted that the new headquarters should help to increase greatly the importance of the center in supporting UW space efforts.

"The Space Science and Engineering Center is a university-wide facility to assist various staff members who want to undertake projects in space research," Anderson explained.

The center will be available for use by any faculty member with the rank of instructor or above and will eventually consist of four main departments.

A research group, consisting chiefly of post-doctoral fellows, will be concerned with instrumentation of space research probes.

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A program management group will work with members of the departments of astronomy, physics, and meteorology in supervising the university's role in major projects such as TIROS, Explorer, and Saturn.

An administrative and technical group will provide service in preparing project proposals and drawing up contracts as well as offering a machine shop and electronics fabrication facilities to build and test instruments. This group will also be involved with processing data returned from the university's space efforts.

Finally, an engineering design group will be available "to translate ideas into workable hardware," according to Anderson.

Funds for the space center come from the State of Wisconsin, the National Aeronautics and Space Administration, and the Environmental Science Services Administration of the Department of Commerce.

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AGREEMENTS WITH THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Grant or Contract No.	Project Director, Department, Title of Project	Period	Est. Cost	Funded to Date
NsG-601	P. S. Myers and O. A. Uyehara Engineering - Mechanical "Study of Oscillatory Combustion and Fuel Vaporization"	6/1/64 - 5/31/68	--	$ 230,000
NAS5-9677	V. E. Suomi and R. J. Parent Graduate - Space Science & Engr. Center "Design, Develop, Fabricate, and Deliver Instrumentation for a Multicolor Spin Scan Camera Experiment for the ATS-C Spacecraft"	9/30/65 - 1/1/68	$ 952,570	852,397
NASw-65	V. E. Suomi and R. J. Parent L & S - Meteorology and Engr. - Electrical "Meteorological Satellite Data Processing"	5/28/59 - 10/31/67	1,092,050	1,092,050
NsG-275	R. M. Bock and J. O. Hirschfelder Graduate School and L & S - Theor. Chemistry "Multidisciplinary Research in Space Science and Engineering with Special Emphasis on Theoretical Chemistry"	7/1/62 - 6/30/70	--	3,670,000
NGR-50-002-041	Larry Haskin L & S - Chemistry "Neuron Activation Analysis for Rare Earths, Lanthanides, and Yttrium, on Simulated Lunar Samples"	6/1/66 - 6/30/68	---	38,000
NGR-50-002-078	Elliot C. Dick Med. - Preventive Medicine "Study of Methods to Effect a More Complete and Rapid Detection of Human Infectious Agents"	6/1/67 - 5/31/68	--	26,460
NAS5-1348	A. D. Code L & S - Astronomy "Development of a Satellite Borne Instrumentation System"	7/10/61 - 10/1/68	4,744,953.27	4,265,044.50
NsG-618	A. D. Code L & S - Astronomy "Investigations and Studies of Ultraviolet Stellar Spectra and Associated Instrumentation"	4/1/64 - 3/31/70	--	660,420
NsG-439	Eugene N. Cameron L & S - Geology "Quantitative Investigation of the Mineralogy and Petrography of Stone and Iron Meteorites"	7/1/63 - 6/30/69	--	112,225

NsG-(T)-23	R. M. Bock Graduate School "Predoctoral Training Program in Space Related Sciences and Technology"	9/1/63 - 8/31/70	--	1,069,700
NAS5-10373	Stig A. Rossby L & S - Meteorology "Design, Development, Test, Fabrication and Support of Sferics Instrument for the Nimbus "D" Satellite"	11/23/66 - 7/27/67	559,412	100,000
NGR-50-002-051	John R. Cameron Med. - Radiology "Applications of the Direct Photon Absorption Techniques for Measuring Bone-Mineral Contents, In-Vivo"	9/1 '66 - 8/31/68	--	53,078
NAS8-21015	W. L. Kraushaar and F. Scherb L & S - Physics "Development and Construction of X-Ray Astronomy Experiment SO-27"	9/30/66 - 9/30/68	679,101	679,101
NGR-50-002-044	W. L. Kraushaar and F. Scherb L & S - Physics "Research in Cosmic and Solar Physics"	9/1/65 - 12/31/67	--	370,447

9/21/67

NEWS FROM THE UNIVERSITY OF WISCONSIN
Statewide Communications Service, 10 Bascom Hall, Madison, 53706

11/4/66 jb

RELEASE Immediately

GIFTS AND GRANTS

MADISON, Wis.--The University of Wisconsin regents Friday accepted grants and gifts and approved contracts with federal agencies aggregating $4,762,600.

The allocations included 50 from Wisconsin sources for various purposes, and two from federal agencies for Madison campus construction projects.

The National Aeronautics and Space Administration provided $1,700,000 to defray a portion of costs incurred in building the University's new Space Science and Engineering Center. Another $1,195,775 was provided by the National Science Foundation toward construction of the Meteorology Building.

The National Institutes of Health contributed $239,775 to support the Laboratory of Neurophysiology's Center for Research in Cerebral Localization, and $201,772 for the Epilepsy Research Center, also in Madison.

The University Extension will direct a training program for community action personnel in the Great Lakes region with $200,732 provided by the U.S. Office of Economic Opportunity.

Other allocations included $120,000 from the Ford Foundation to support a five-year Law School program of graduate fellowships in land-use law, and $195,000 from the Rockefeller Foundation for department of economics' studies of the social and economic implications of disease control in St. Lucia, West Indies.

Fairbanks-Morse Inc., Beloit, presented $12,485 for the department of mechanical engineering study on "Mathematical Simulation of the Two-Stroke Diesel Engine Cylinder."

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Contributions from Wisconsin sources included:

Nekoosa-Edwards Foundation Inc., Port Edwards, $975; Wisconsin Society for Jewish Learning Inc., Milwaukee, $7,500; United Cerebral Palsy of Dane County Inc., Madison, $800; Wisconsin Student Association, Madison, $21,028;

St. Croix-Pierce County Bankers' Association, New Richmond, $1,000; friends of the late Prof. C.P. Higby, $26; Northwestern Mutual Life Insurance Co., Milwaukee, $1,000; Ladies Auxiliary of the Wisconsin-Upper Michigan Florists' Association, $150; Production Credit Association of Wausau, $100;

Manitowoc County Bankers' Association, Manitowoc, $300; Wisconsin Alumni Research Foundation, Madison, $400; Production Credit Association of Janesville, $100;

Hooper Foundation, Manitowoc, $350; Madison General Hospital, $250; Wisconsin Road Builders' Association, Madison, $500;

Robert Vander Linden family and friends, Appleton, $200; Johnson Service Co., Milwaukee, $250; Mrs. Harold W. Heser, Kenosha, $60; friends of the late H. J. Kinkade, Burlington, $100; Mrs. F. A. Henney, Madison, $34;

Mrs. Madeline Gillilan, Lancaster, $19; Mrs. Rodney Nelson, Sand Creek, $10;

Mr. and Mrs. Simon Gorwitz, Oshkosh, $15; Dr. R. O. Ebert, Pine River, $20; United Fund of River Falls Inc., $2,847; Mrs. Edward Shovers, Racine, $25;

Donald L. Graycarek, Brookfield, $25; United Community Fund of Elkhorn, $100; friends of the late Mrs. Mary K. Folsom, Green Bay, $160; Prof. Robert West, Madison, $250; Dr. Niroshi Sugiyama, Madison, $1,232;

Friends of the late Mrs. Grace Mohs, Madison, $253; Wisconsin History Foundation, Madison, $3,250; State Department of Public Instruction, Madison, $6,320; Wisconsin Association for Retarded Children Inc., Madison, $1,300; Wisconsin Department of Agriculture, Madison, $6,000;

S.E.M. Foundation Inc., Milwaukee, $7,430; Wisconsin Idea Theatre Foundation, Madison, $6,500; friends of the late Prof. Harlow Halvorson, Madison, $416; Lutheran High School Association of Greater Milwaukee, $25; friends of Prof. Don Kanel, Madison, $128; Wisconsin Telephone Co., Milwaukee, $250;

Meridian Laboratories Inc., Lake Geneva, $250; County of Milwaukee, $1,000; Murphy Product Company Foundation Inc., Burlington, $500.

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NEWS FROM THE UNIVERSITY OF WISCONSIN
Statewide Communications Service, 10 Bascom Hall, Madison, 53706

RELEASE Immediately

4/1/66 jb

EARTH-SPACE SCIENCE BUILDING

MILWAUKEE, Wis.--Initial plans and specifications for an Earth and Space Science facility on the Madison campus were approved by the University of Wisconsin Board of Regents Friday.

The new $4.3 million structure will be located on the southeast corner of West Dayton and North Orchard Sts. The National Aeronautics and Space Administration is providing $1,750,000 of the construction cost, the National Science Foundation $1,250,000, and the state the remainder.

Construction is expected to start next November and be completed in 24 months.

The Earth and Space Science Building will be a 15-story project, with 100 offices and 53 laboratories for the University meteorology department, and 20 offices and 38 laboratories for the space sciences.

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NEWS FROM THE UNIVERSITY OF WISCONSIN

Serving the state through campuses at Madison and Milwaukee, nine University Centers, and a statewide extension system.

8/20/65 rt

RELEASE Immediately

MADISON, Wis.--Prof. Martin B. Loeb, member of the University of Wisconsin's Madison campus School of Social Work since 1961, was named its director Friday by University of Wisconsin regents.

His appointment, to succeed Prof. E. E. LeMasters who served as Social Work director from 1960 until he resigned his administrative duties this year to concentrate on teaching and research, was one of eight administrative changes included in the University's 1965-66 budget action.

In other major changes, Prof. Verner E. Suomi, UW meteorologist who has served as chief scientist for the U.S. Weather Bureau and was one of the developers of the University of Wisconsin satellite weather "packages," was named director of the University's new Space Science and Engineering Center; and Dean Edwin Young of the College of Letters and Science was assigned the additional duties of studying possibilities for a new undergraduate campus in Madison.

In Madison campus administrative appointments, the regents named Donald E. Percy, assistant director for administration of the U.S. Army Mathematics Research Center since 1963, as assistant dean of the College of Letters and Science; Barbara Newell of Purdue University as assistant to Chancellor R. W. Fleming; and Josiah S. Dilley, lecturer in counseling and behavioral studies, as assistant dean for student personnel services in the School of Education.

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Add one--appointments

John J. Solon, associate director of the University of Wisconsin Press since 1952, was appointed director of Summer Sessions at UW-Milwaukee and assistant to UWM Chancellor J. Martin Klotsche.

Samuel F. Lewis, of Southern Illinois University at Edwardsville, was named associate director of University Center System libraries.

Explaining Dean Young's additional assignment, Chancellor Fleming said:

"It is difficult to evaluate the merits of a new undergraduate campus in Madison without defining in fairly precise terms what kind of an institution we have in mind. Faculty members quite rightly ask what the relationship between the new campus and the old would be, what kind of an academic program would be offered at a new campus, whether traditional organizational patterns would be followed, whether one could prevent the new campus from being 'second class,' and so on.

"Before these questions can be answered, we need a good deal more information, both about what others are doing and what our own possibilities are.

"Dean Young, with his experience and insights into the operation of a liberal arts college, is eminently qualified to study the questions which are involved and to make a report which will lead us to the most sound decisions."

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