Verner E. Suomi: emeritus professor of meteorology. 1986/1995

[Madison, Wisconsin]: [s.n.], 1986/1995

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Verner Edward Suomi, 1915—1995

Professor Emeritus Verner Edward Suomi died peacefully Sunday afternoon, July 30, at University Hospital at the age of 79 after a long battle with heart disease. He was internationally recognized as the "father of weather satellite systems" and throughout his career made numerous important contributions to the fields of meteorology, space science and engineering.

Professor Suomi spent his entire career at the University of Wisconsin-Madison except for a year's service as Chief Scientist of the U.S. Weather Bureau in 1964. He joined the UW faculty in 1948, and was a much beloved teacher in the Departments of Meteorology and Soil Science and the Institute for Environmental Studies until his retirement from formal teaching in 1986. In 1967 Professor Suomi founded the UW-Madison's Space Science and Engineering Center (SSEC) and under his direction it became a world-renowned mecca for weather satellite research and development. Professor Suomi continued to be actively involved in research after his retirement from the SSEC directorship in 1988, designing instruments, directing field experiments, and advising scientists in atmospheric science projects until the week of his death. He also continued teaching a weekly undergraduate meteorology course in emeritus status.

Professor Suomi's influence on the international earth science and meteorology scientific community was immense. His special genius came from his unique ability to combine scientific insight with engineering efficiency. Professor Suomi is best known for his invention of the "spin-scan" camera which enabled weather satellites in geostationary orbits to image the earth continuously, yielding the weather satellite pictures now familiar to all TV-weather watchers around the world. He was also an inspirational force in planning interplanetary data-collecting missions to Venus, Jupiter, Saturn, Uranus and Neptune, leading to better understanding of their atmospheres.

Throughout his career, Professor Suomi served as chairman or on the directorates of numerous national and international scientific organizations and committees, in which he effectively promoted the application of space systems to improve weather services. He received many scientific honors, including the National Medal of Science awarded by the President of the United States in 1967, the Franklin Medal, the World Meteorological Organization's IMO Prize, and the first Walter Ahlstrom Prize, which included a $55,000 award that he donated to the U.W. Foundation for Research.

Professor Suomi is survived by his wife, Paula and his children Eric (Madison, WI), Stephen (Bethesda, MD), and Lois (Charles) Young and grandchildren Emily and Elaine Young (Houghton, MI), sisters Esther Zikmund (Hibbing, MN) and Edith Bachman (Denton, TX) and numerous nieces and nephews. His parents, John and Anna, predeceased him.

Interment will take place near the family home in southern Minnesota in a ceremony for immediate family. A memorial service will be held in Madison at Luther Memorial Church, 1021 University Avenue, at a date to be soon determined.

In lieu of flowers, the family requests donations to the University of Wisconsin Foundation, Suomi Memorial Fund, P.O. Box 8860, Madison, WI 53708-8860. Please call 262-0544 for further information.

A Tribute to Verner E. Suomi

(Donald R. Johnson, August 19, 1995)

Mrs. Suomi, Steve, Lois, Rick and grandchildren, and friends and colleagues of Professor Verner Suomi. By our presence today, we have gathered to honor a colleague and friend, Professor Verner E. Suomi, who through his accomplishments attained legendary status as a scientist, locally, national, and internationally. As a friend and colleague within this university setting, it is my privilege today to represent the many like friends and colleagues in expressing, first, our sympathy and, second, our appreciation for sharing this individual with us in the conduct of our daily activities. Today, in a very basic sense, we are celebrating the life of Verner Suomi, not joyfully, but thankfully for his presence among us, both as a scientist and as an unusually warm, sensitive individual. My brief remarks will not focus on his scientific contributions, since such remarks will follow. Rather I wish to focus on the human nature of this individual and his relations to us as a friend and colleague; let us say the heart, mind and spirit of a rare individual who gratefully enjoyed life on this earth to the fullest, even his very last days.

Life to the fullest for Verner included stimulating and thoughtful conversations, frequently involving science, at least with those of us who were university colleagues. However, on occasions the subjects turned to other matters. On one occasion approximately, one week before Professor Suomi passed away, I visited him in the hospital. As I entered his room he was discussing some personal affairs. What this conversation was concerned with, I do not know. However, on conclusion of his telephone conversation he made a special request. The request was that if a memorial service were to be held on his behalf, besides assisting Bob Fox in arrangements, each of you were to be personally thanked for making his life so enjoyable and fruitful. A supplement to this request which I know Verner Suomi would wish to make is to express his appreciation to the several Executive Directors of SSEC who served him, in particular, Charles Anderson, Tom Haig and Bob Fox. They were the handymen who through devotion to this individual and daily activities were instrumental in making many of his dreams come true.

As I indicated earlier, my remarks will focus upon this individual as a personal human being in his dealings with us. I will attempt this by recalling some experiences that we enjoyed. Besides the frequent scientific conversations, other conversations occasionally involved family, mutual friends and their activities, trips of Paula and Verner to Michigan, Minnesota and some other experiences in Minnesota and the University of Chicago during his early life from which he benefited. First, concerning the generous heart of this individual. I always remember one which I believe was relayed by Mrs. Marie Riggs several decades ago. In the 60s, while in 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. Verner Suomi was an incredibly sensitive individual with an unusually warm heart for those who needed a friend, comfort, advise or support.

Concerning his mind, it was incredibly active and creative. In this regard, I remarked to a few friends that Verner Suomi never rests from science, even while in the hospital. He simply enjoyed scientific discussions over a wide range of subjects. One of his two favorite subjects during his last days concerned his own device, now floating on the Atlantic Ocean and measuring the energy transfer between the ocean and the atmosphere. The other subject concerned measurements of temperature and water vapor being made by two satellites and the bending of the electromagnetic signal being transmitted from one to the other. Because of the recent success of this experiment by other individuals, he wished to congratulate and thank them plus very likely offering some friendly advice. One of these individuals was a scientist in the government who had made this experiment possible by providing funds at some considerable risk. I would like to quote from an email message received from this individual concerning his stimulating conversation on the Monday before Professor Suomi's death. **"It was an extraordinary phone conversation, one half hour or so totally devoted to science and, in particular, the GPS/Met and his ideas about how it should continue to develop and be used. He described, in great detail, his conversation that morning with JPL scientists and engineers about how to fix the multi-path problems they were having in extracting the moisture profiles from the raw GPS signals -- incredible, yet so much like the man and the scientist. I consider it an honor to know and to have learned so much from him. He leaves many "footprints" in science, education, and to humanity."** There were other conversations on Monday and Tuesday of that last week which elevated Verner's spirits to an unusual level.

Last and most important there are lessons to be learned from his spiritual well being. 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. This childhood prayer known to many of us is:

> 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.

I would like to conclude by noting that there were many occasions where he emphasized his spiritual views, usually through example, sometimes through testimony. Bless us Lord and the memory of our friend and colleague, Professor Verner E. Suomi. Amen.

A Eulogy to Verner E. Suomi

(Wlliam L. Smith, August 19, 1995)

Paula, Steve, Lois, and Rick, Grandchildren and Extended Family, Friends, Colleagues, and Students of Verner E. Suomi, we mourn our loss, from earth, of a man whom we admired, respected, and all loved so very much. Speaking on behalf of the scientific community who knew him well, there is little doubt that Vern Suomi was the most genius, as well as the most enthusiastic scientist with whom we have ever come in contact. A world renowned weather scientist, Joanne Simpson, suggests that Vern Suomi is one of the two greatest meteorologists of this century, a suggestion with which few, if any, would disagree. As the Father of Satellite Meteorology, the innovator of the world's geostationary satellite weather surveillance system, Vern's professional contributions will truly benefit all of mankind for many generations to come, if not till the end of time. Professionally, Vern Suomi was a giant, a superman. He was our leader; enthusiastic, doggedly determined in achieving each important goal, always optimistic but realistic. His genius was displayed by his ability to communicate complex notions using simple everyday analogies. Unlike most of us scientists, he never needed to resort to equations to illustrate or to prove his theories. His understanding was based on an inherent and keen sense of physics and on his engineering practice; he taught us by explaining and illustrating the physical basis of his innovative concepts using easily understood "common sense" and familiar principles we practice as part of our every day life. Professor Suomi's intellectual genius was intimately connected to his unique vision of simple, and elegant, solutions to important and often complex problems. (He often told us that he practiced the "KISS" principle; "Keep It Simple Suomi"!).

Vern's excitement and wit always made scientific discussions fun as well as productive. His presence would change the entire character of a meeting and usually its outcome; his inspirational use of "one liners" would quickly cut through politics and bureaucracy to get his point across to the group or individual he was addressing. He told us that two of the universal forces of nature were "Gravity and Greed" and he said that if you were fighting either one of these you were in big trouble! Vern was master of the process to communicate his most important message quickly and effectively.

Many of us here today owe much of our professional successes to Professor Verner Suomi. He was a professional father, a relationship shared by a large community of younger scientists and former students. I have been truly amazed at the number of scientific colleagues with whom I have talked in the past two weeks who have 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!

Most important to those of us fortunate enough to have personally interacted with Verner Suomi, was that he was a wonderfully caring person. This characteristic captured our personal love and loyalty, as well as our professional respect and admiration. This "caring" trait of Vern was displayed in many ways; enthusiasm to share with us his often continuous stream of ideas, unending patience for us to achieve the level of accomplishment he felt that we were capable of, his genuine and generous support for us in our own professional and personal endeavors.

We all have personal experiences to share regarding Vern Suomi's caring support. One example was recalled recently by Hank Schmidt, a National Weather Service employee who worked with Vern Suomi to implement into weather service operations his last geostationary satellite innovation, the VISSR Atmospheric Sounder. I am using it because I personally remember this event very clearly having been with Vern and Hank at the Chinese restaurant down on Regent street here in Madison when it happened. Hank now relates the event as follows: "You may not know that Professor Suomi was a part-time therapist. I am one of Vern's patients. Years ago, August 23,1983 at 12:30 PM in a Chinese restaurant, he administered his special " Stop Smoking" therapy to me. When we finished lunch, I lit up and Vern inquired, "Hank, when are you going to stop smoking?" Without hesitation I replied, "when you give me the same incentive that you gave to Larry Sromovsky. Without hesitation, Vern took his checkbook and wrote me a check, post dating it for August 23, 1984. I promptly acknowledged by snuffing out what remained of my cigarette and pocketing the check. Needless to say I had tried many times before to kick the habit. Vern's therapy worked! I've never smoked since that day, and I still have the check. Vern was undeniably a very bright man; however, I think he never understood the reason his "check therapy" worked. He thought it was the check, the money. Wrong. It worked because it was His check. It worked because it was a check with Vern's signature on it. It worked because that signature was the signature of a man I admired. It worked because that check represented a challenge put to me by one who thrived on having challenges put to him. It worked because that man cared enough about me. Thank you Professor (Doctor) Suomi." Signed Hank Schmidt.---

There are few people we meet as part of our professional lives that we grow to love as much as we love Verner Suomi. We miss him terribly. I pray that his inspiration, optimism, simplicity, and caring nature will live within each of us as we try to carry on in this life without him. Vern, I know that your inspirational force is so strong that it will remain with us. We look forward to meeting you in our next and eternal life.

With insight and elegantly simple instruments,
Verner Suomi studies planetary atmospheres

A Gift for Simplicity

Every time he sees a satellite weather map on the television news, Verner E. Suomi, emeritus professor of meteorology, feels satisfaction. "Yep, there it is, still working," he says.

People all over the world depend on weather satellites for warning of severe storms, as well as daily forecasts. Thousands of people work to bring us this information. But one man thought of it.

"The basic idea and principle was Verner Suomi's," says Francis P. Bretherton, Suomi's successor as director of the Space Science and Engineering Center (SSEC) at the University of Wisconsin-Madison. "What's more, it was he who convinced the powers-that-be to try it."

Verner Suomi holds a prototype of part of the sea surface sonde. This is the latest of a series of instruments he has developed to study the atmospheres of Earth and the other planets.

Suomi, a winner of the National Medal of Science, has invented many instruments to observe the weather on Earth and other planets and has been a key figure in organizing space missions. Suomi also founded SSEC, bringing together scientists and technicians to build instruments, process space data, and use the results to understand weather and climate.

"Not only does Vern keep his eye on the basic science, but he has a flair for designing elegantly simple gadgets and a knack for getting people moving," says Bretherton, who previously directed the National Center for Atmospheric Research in Boulder, Colorado. "It's simply impossible for anyone else to fill his shoes."

First Steps into Space

Early in his career, Suomi appreciated the ways that space science and meteorology might enhance one another. He joined the UW-Madison meteorology department in 1948, and got involved in the space program during the 1950s. "In those days, most of the rockets went into the ocean," he recalls. One had to be blown up—with his equipment aboard—when it went off course.

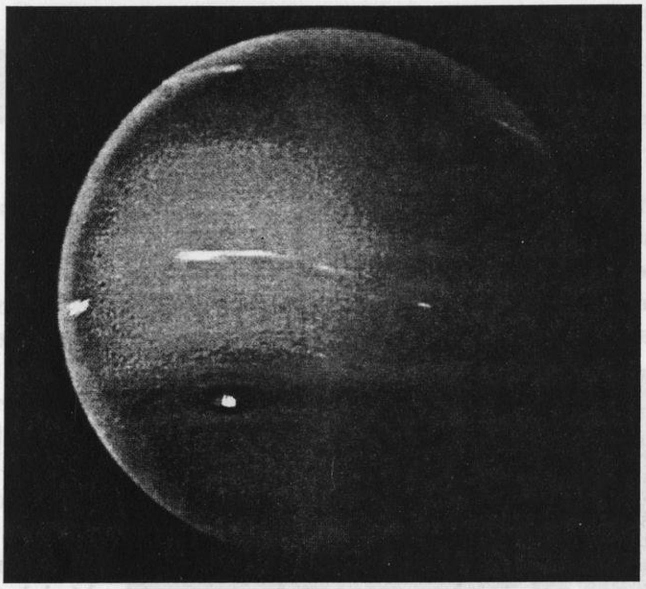
"Finally," Suomi continues, "we got something flying that measured the heat budget of the Earth. It had only moderate accuracy, but it gave us the very first picture of the heat coming towards and leaving the Earth.

"All the people now worrying about the greenhouse effect are really worrying about Earth's heat budget," says Suomi, who holds the Harry Wexler professorship in meteorology. If "greenhouse gases," like carbon dioxide or methane, unbalance the budget by trapping outgoing heat radiation, the planet will heat up until it comes into balance again.

Geostationary Weather Satellites

By the mid-1960s, Suomi was hatching plans for geostationary weather satellites. At that time, the United States had weather satellites which circled the earth speedily, returning to the same spot about 12 hours later—plenty of time for the weather to change in unexpected ways. Suomi realized that weather could best be monitored by geostationary satellites. In their day-long orbits, moving in sync with the Earth's rotation, the satellites appear to "stand still" above a certain spot on the Earth's equator. "With a geostationary satellite, the *weather* moves, not the satellite," giving an uninterrupted view of the changing weather patterns, says Suomi.

He convinced the National



On Neptune, as seen by Voyager 2, white streaks are methane clouds, while dark spots mark giant storm systems. Methane gas produces the blue color; the red is a high-altitude haze. SSEC scientists are still analyzing Voyager data and hope to uncover the causes of Neptune's high winds.

Aeronautics and Space Administration (NASA) to put a weather camera on board an already-planned "spin-stabilized" geostationary satellite for communications. (He explains that a non-stabilized satellite tends to tumble and wobble, making it hard to take pictures. The simplest way to prevent this is to spin the satellite. The spin prevents it from tipping over, just as spinning wheels keep a moving bicycle upright.)

That still left Suomi with the problem of how to take "rock-solid" pictures from a rapidly spinning spacecraft. His simple solution was to create the "spin-scan" camera, which *uses* the spin to take the picture. It works somewhat like a television, building up a picture line by line, he explains. As the camera spins with the spacecraft, it scans one line of the image. Then it drops down a little bit, and on the next spin around it scans the next line, and so on until the image is complete.

Suomi developed the camera with the late Robert J. Parent, professor of electrical engineering at UW-Madison. "He was like my brother," Suomi says. "We worked day and night. But we enjoyed it!"

Their "exceedingly simple" camera gave a high-quality picture—2,000 lines of image, as compared to 500 for ordinary television. Today, spin-scan cameras with 16,000 lines orbit on the GOES satellites, as the geostationary weather satellites are called.

The Birth of SSEC

Building instruments for spacecraft took a good deal of time and money, and, Suomi says, that began to overload the administrative capabilities of the meteorology department. "In 1966, we reorganized as the Space Science and Engineering Center, and NASA and the National Science Foundation provided funding to construct a new building. Becoming a center also made it easier to do interdisciplinary work," he adds.

Suomi became the first director of SSEC, a post he held until 1988. "My rule when I ran this place was to find competent people, give them a goal, and then *get out of the way!* Because they'll move faster than you do."

Suomi adds, "We worked hard, but it didn't *feel* hard. It was fun! In the early days I used to keep a sleeping bag here and stay all night to run tests."

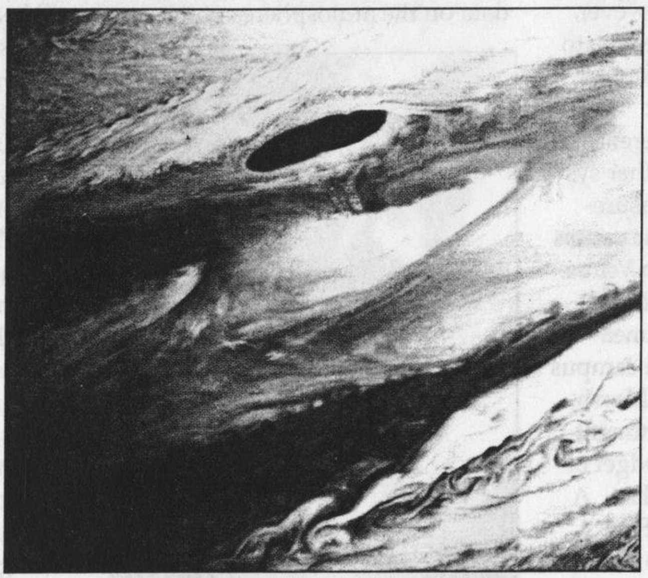
The center now includes about 150 people: professors, staff scientists, engineers, computer programmers, and administrative and support staff. Its mission is threefold: to develop and fabricate spaceflight hardware; to provide access, image processing, and interactive computing for planetary atmospheric data; and to study the atmospheres of Earth and the other planets.

Building Instruments for Spacecraft

Since the spin-scan camera, a steady stream of space instruments have left SSEC aboard Earth-observing satellites. Suomi and center staff have developed several "sounding instruments" that can probe the structure of Earth's atmosphere from top to bottom. Describing one that employs an ingenious method of measuring temperatures, Suomi says, "It's like having a thermometer with a stem 22,000 miles long!"

SSEC has also collaborated with other departments to develop special hardware. Professor William L. Kraushaar of physics has drawn on SSEC's expertise in designing two instruments to observe X-rays emanating from space. The first one provided some of the first maps of the sky as seen in X-rays; the second will reveal the distribution of hot gas in nearby regions of our own galaxy.

More recently, SSEC helped astronomy professor Robert C. Bless and the Space Astronomy Laboratory to build the High Speed Photometer, one of six scientific instruments on the Hubble Space Telescope. Part of NASA's "Great Observatories" program, the telescope is scheduled to be launched in mid-April of 1990.



A close-up view of Jupiter's atmosphere shows dark and light bands, oval storm systems, and tremendous turbulence. Bands are also a feature of Saturn's and Neptune's atmospheres. The high winds that blow east and west along the bands are probably due to the rapid rotations and deep atmospheres of these planets.

Other Planets: A Vortex on Venus

The other planets have much to tell us about how planetary atmospheres function, says Suomi. In 1974, he was a member of the imaging team for the Mariner mission to the inner planets. Suomi and Sanjay S. Limaye (then Suomi's student, now an associate scientist at SSEC) studied ultraviolet images of Venus' clouds. Piecing together many images by computer, they found a vortex circling the pole in view and likely at the other pole as well.

The other members of the imaging team, who were mostly geologists, were skeptical, recalls Suomi. "They said, 'Just because it *looks* like a vortex, doesn't mean it *is* a vortex.' I said, 'Fine. Then when you see those round basins all over Mercury, *you* can't call them craters!'"

Other observations from a Venus orbiter have since confirmed the presence of the vortices.

Suomi seems to enjoy the clash of ideas that sometimes is a part of science. He stresses to his graduate students the importance of knowing how to defend their ideas. He tells them, "I'm going to try to 'cut your head off,' and if I do cut it off, I'll glue it back on. But when you get out in the real world, they're going to cut it off and leave it off!

"With undergraduates," he adds, "our task is not only to teach fundamentals, but to make it interesting and *fun*, so people will choose science as a career. We need them and their ideas."

The Instrument That Won't Die

To come up with as many useful ideas as Suomi, however, would be a feat. In 1978, when the Pioneer Venus mission reached Venus, three probes separated from the main craft and plunged into the planet's hot and corrosive atmosphere. Each carried a Net Flux Radiometer designed and built by a team led by Suomi. These instruments measured the heat budget of Venus' atmosphere to about 10 kilometers above the surface, at which point all sensors outside the probe stopped, probably due to an electrical discharge. The equipment inside, however, continued working all the way to the ground—and even after impact.

Since temperature differences and heat flows drive weather systems, the heat budget measurements gave insight into the causes of the weather patterns on Venus.

This was not Suomi's first radiometer. The first one measured the heat budget of a campus cornfield near University Marsh, and the next was the instrument that measured the heat budget of the Earth. Nor was it the last. A newer version of the Net Flux Radiometer will drop into Jupiter's atmosphere in 1995. Built by a team headed by senior scientist Lawrence A. Sromovsky of SSEC, the instrument is now en route to Jupiter aboard the Galileo spacecraft.

And Sromovsky and SSEC senior scientist Henry E. Revercomb are currently proposing to send yet another radiometer down into the mysterious atmosphere of Titan, the giant moon of Saturn. This probe would be part of the Cassini mission, now under development by NASA.

Voyager: Exploring Strange New Worlds

The Galileo and Cassini missions follow in the path of the Voyagers. Voyager 1 and Voyager 2 sent us our first close-up images of the giant outer planets Jupiter, Saturn, Uranus, and Neptune, and their weird and wonderful moons and rings.

Both Voyager spacecraft have now left the planets behind and are sailing off toward the outer edge of the solar system. But Suomi, Sromovsky, and Limaye—all members of the Voyager imaging science team—will be studying data on the atmospheres of these

The atmosphere of Saturn, seen in a color-enhanced Voyager image, reveals wind-related bands similar to structures seen on the atmospheres of Jupiter and Neptune.

outer planets for some time to come.

Of special interest to Suomi are the high-speed winds—up to 1,500 miles per hour—found on the outer planets. "That's a tremendous puzzle," says Suomi. "We tell our students that atmospheres are heat engines, and that's what drives the winds. Yet the planets that get the least solar heat—the outer planets—have the fastest-moving air. *How come?"*

Suomi thinks part of the answer lies in the depth of the atmospheres. While Earth's atmosphere is very thin—"thinner than the skin of a peach," says Suomi, the outer planets have deep atmospheres—"thicker than a grapefruit peel."

What's more, the outer planets rotate very rapidly despite being much larger than the Earth. Because of the rotation, gas welling up from below will be deflected toward the west, and falling gas will head toward the east.

This deflection is related to the Coriolis effect—which causes hurricanes to rotate counterclockwise in Earth's Northern Hemisphere and the opposite way in the Southern Hemisphere—but it affects vertical rather than horizontal motions. Suomi says, "We generally ignore the vertical deflection on the Earth, because Earth's atmosphere is so shallow and slowly rotating. On these other planets you have to take it into account."

Suomi and professor Donald R. Johnson of SSEC have been discussing computer models that could do just that. If the models included key features of the outer planets—an interior heat source, rapid rotation, and a deep atmosphere—the models should develop high winds and east-west circulation patterns resembling the alternating "belts" found on those planets. "At the moment, it's at the 'back of the envelope' stage," says Suomi.

Measuring the Importance of Water

There's another important difference between Earth and the other planets: water, says Suomi. Earth is the only planet with oceans and with significant amounts of water vapor in the atmosphere. That may act like a thermal "short circuit" in the atmospheric heat engine.

"Much of the heat of sunlight is absorbed in Earth's oceans," says Suomi. "A lot of that heat is carried back to the atmosphere by evaporating water. And then, when the water vapor condenses—when it rains—that heat is released to the atmosphere.

"So our atmosphere is to a very large extent heated by condensation," Suomi continues. "But we don't know how much water is being evaporated over the oceans, and we don't even know how much it's raining over the oceans! We have to measure what's happening over the oceans if we want to understand the climate."

Suomi is now working on yet another simple gadget, called a sea surface sonde, which he hopes will make it possible to measure the total heat flow from the ocean to the atmosphere and space.

Suomi's main worry is keeping the instrument floating right at the surface. "It has to be riding on the tops of waves—not underwater." He's done some informal testing—in the laboratory and on Wisconsin lakes—and now seeks funding for more formal and extensive tests.

"Vern's bubbling with enthusiasm about this new gadget," says Bretherton. "Of course, he's still got to make it work. If he does it's a major breakthrough."

Future Directions for SSEC

"Vern's gadgets are basically so simple that you say, 'Now why didn't *I* think of that,'" says Bretherton. "If he can't do it in the kitchen sink, it's probably too complicated." In fact, Suomi did his first test of the spin-scan camera concept in his basement, using a dirty window, a paper plate, an electric fan, and some simple electronics.

But space science seems to have less and less room for this kind of simplicity, Bretherton adds. The engineering is increasingly complex, as are the processes of getting funding and integrating all systems on the spacecraft. Thus, the opportunities for university groups in building spacecraft are decreasing, though so far SSEC has maintained a strong program. Nevertheless, SSEC's long-standing expertise in image analysis will provide a complementary focus of increasing importance.

When the first spin-scan camera went up in 1966, the data started flooding down, and the need for image processing facilities soon became apparent. "Our first 'image processing' was graduate students walking around in their stocking feet, taping together huge arrays of computer printouts," says Suomi. "That was no way to do things!"

Thus the creation of McIDAS—Man computer Interactive Data Access System. With this system, researchers can manipulate and analyze data from both space and ground-based sources, comparing and overlaying data from several sources. The system, which is interactive and flexible, has enabled researchers to interpret atmospheric data from other planets and compare different planetary weather systems.

There are now several dozen McIDAS installations across the world. A large group within SSEC is dedicated to maintaining and upgrading the system. Bretherton and professor John R. Anderson of SSEC want to expand McIDAS's capabilities by re-evaluating GOES weather satellite data that have been archived at SSEC over the past 12 years. Most of these images have been examined only once, "on the fly." Hiding in them may be important information on Earth's weather and climate.

Recycling Data

"Frankly, we haven't known how to handle all that stored information," says Bretherton. He explains that weather images are quickly boiled down to a few numbers—the "climate products." Then the satellite images disappear into the archives.

"Later on, of course, you think of better ways to analyze the images," he says. But until recently, reprocessing the archived data has been far too cumbersome and expensive to consider. Now, with improved special-purpose computers, SSEC should be able to go back through the tapes and extract new data.

"For example, we can use the archive to look at how and where clouds form," says Bretherton, "which is an important piece of information for climate models that predict the course of the greenhouse effect."

"With all these environmental problems, it's necessary to learn about the whole earth as a system and to improve our understanding of nature," says Suomi.

"And it's rewarding when you can do something useful for mankind," he says. "For example, when Hurricane Hugo went past in 1989, many more people would have been killed if we had not had a geostationary satellite up there watching it carefully."

Reflecting on this and other accomplishments of SSEC, Suomi says, "It's been a blessing to have these competent and dedicated people be part of my life. I just have dreams; they have made them come true."

Barbara Armstrong

UW community mourns the loss of Belzer, Suomi

Belzer's organ transplant work gave life to many

Lisa Brunette
CHS Public Affairs

"[Folkert Belzer] embodied the ideals of the academic physician — a teacher, a researcher and an exemplary doctor."

Chancellor David Ward

Dr. Folkert O. Belzer, a world leader in organ transplantation and chair of the surgery department at the University of Wisconsin Medical School, died of cancer Aug. 6 at the age of 64.

An internationally renowned researcher, Belzer may be best known for transplant organ preservation. In the late 1960s, he and assistant Robert Hoffmann (now director of the UW Hospital organ procurement program) developed a perfusion machine that kept human kidneys viable for transplant for several days instead of just a few hours.

Later in his career, Belzer gained acclaim for the development of UW Solution, an organ-preservation fluid widely introduced into transplant surgery in 1989.

Belzer and UW Medical School biochemist James Southard, Ph.D., developed the revolutionary solution that by dramatically extending the life of transplant organs. Both discoveries increased the supply of usable organs and allowed more time for tissue matching, improving the likelihood of transplant success.

"The University of Wisconsin has lost one of its most eminent faculty, and transplant patients the world over have lost one of the field's most creative scientists," said Chancellor David Ward. "He embodied the ideals of the academic physician — a teacher, a researcher, and an exemplary doctor."

Dr. Philip Farrell, dean of UW Medical School, praised Belzer's leadership of the surgery department. "Fred Belzer is largely responsible for the growing international recognition our department of surgery has enjoyed over the last two decades," he noted. "His commitment to excellence has attracted the finest caliber of faculty to the department, and there is no greater tribute than to carry on that tradition in the future."

Gordon Derzon, UW Hospital superintendent who began the same year Belzer arrived, saw him develop the surgery department into one of the most highly regarded in the nation.

"The entire department was transformed during his time as chairman," Derzon said. "The scope and the quality of services that we offer today have grown directly from his leadership. All of us are greatly indebted to Fred Belzer for his commitment to advancing education, research and patient care in all of the surgical disciplines."

Said Dr. Hans Sollinger, professor of surgery and chair of UW Hospital's Division of Transplantation: "Dr. Belzer's former students and colleagues are committed to carrying on the tradition of excellence in organ transplantation at the UW and carrying Dr. Belzer's vision into the 21st century."

Born in 1930 in Indonesia, Belzer moved to the United States after World War II and earned his bachelor's degree in chemistry from Colby College in Maine in 1953. He received a master's in biology and, in 1958, his medical degree from Boston University, which recognized him as a distinguished alumnus in 1983. After completing his internship and residency, Belzer spent two years in London before moving to the University of California-San Francisco in 1966 as assistant professor of surgery. He rose to co-chief of the UCSF transplant service by 1969 and became professor of surgery in 1972.

He came to UW-Madison in 1974 as chair of the surgery department and head of the transplantation section.

Belzer was an acclaimed educator, regularly voted as one of the finest teachers. A top-flight clinician, his name appeared regularly on national "Best Doctors" lists. This year, Belzer won one of the most prestigious awards in surgery, the 1995 Medallion for Scientific Achievement from the American Surgical Association. He was named the first recipient of the Pioneer Award of the American Society of Transplant Surgeons.

Belzer is survived by his wife Marion and four grown children.

Suomi's view of world changed us all

Terry Devitt

The death last month of Verner E. Suomi, the first man to envision the world through the eye of a satellite, was a milestone in the history of Wisconsin science.

The loss of a man whose genius was born in making complicated things simple and accessible leaves a hole in the fabric of the university, but it by no means marks the end of Suomi's enormous influence on the scientific enterprise here.

An experiment born in his work is now nearing its rendezvous with Jupiter; another project yields new ways to image the invisible constituents of the atmosphere; yet another is adrift in the Atlantic, an attempt to provide "ground truth" for new and critical measurements of the energy exchange between the ocean and the atmosphere.

Suomi's passing was a reminder of an influence that went beyond science to the human psyche, according to Dennis W. Thomson who, as a graduate student, experienced firsthand the methods and approach to science embodied by Verner Suomi.

The pictures from his cameras, positioned high above the Earth, changed forever the way humans viewed and think about the world, said Thomson who now directs the department of meteorology at Penn State.

Jeff Miller

Verner Suomi's colleagues say in the world of meteorology he was 'a giant, a superman.'

"That was the first whole Earth perspective," Thomson said. "It had a profound impact on the human psyche. Not only could you see the Earth, but you could see an evolving, dynamic system."

A giant in his field, Suomi was widely regarded as one of the most influential meteorologists of this century. His achievements — from determining the energy budget of a corn field to exploring atmospheres of planets – earned him awards such as the National Medal of Science, the American Meteorological Society's Charles Franklin Brooks Award, the Nevada Medal and the International Meteorological Organization Prize.

He was also the 103rd recipient of the Franklin Medal, an award previously given to Enrico Fermi, Albert Einstein, Orville Wright and Thomas Edison.

He molded UW-Madison's Space Science and Engineering Center (SSEC) into a premiere center of satellite meteorology that now employing 190 people and attracts scholars from around the world.

"Professionally, Vern Suomi was a giant, a superman," said William L. Smith, SSEC associate director. His "intellectual genius was intimately connected to his unique vision of simple and elegant solutions to important and often complex problems."

Suomi, said Smith, was known as a generous and compassionate father figure to students and colleagues alike. On the occasion of advising an indigent undergraduate in the 1960s, he reputedly paid the student's tuition out of his own pocket.

Born Dec. 6, 1915, at Eveleth, Minn. He received a bachelor's degree from Winona Teachers College, Winona, Minn., in 1938 and worked for several years as a junior-high mathematics and science teacher.

He received his doctorate in meteorology in 1953 from the University of Chicago and in 1948, at the invitation of Reid Bryson, he joined the faculty here as the second member of the meteorology department.

In 1964, he served as chief scientist for the U.S. Weather Bureau. In 1965, with the late Robert Parent, he founded the SSEC with $500,000 in seed money from the National Aeronautics and Space Administration.

His death on July 30 at 79 was deeply felt by the university community, said Provost John D. Wiley. "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."

Regents forward plans for $33 million budget reduction

Bill Arnold

The day of reckoning on the 1995-97 biennial budget wasn't an easy one for the UW System Board of Regents.

With a $33 million net budget reduction facing them, the board could do little at its special Aug. 24 meeting but send a plan for cuts to the state Joint Committee on Finance, as required by the state budget bill.

This budget represents the first absolute-terms decline since the UW System was created in 1971. Reduction plans will affect UW-Madison, UW-Milwaukee, 11 four-year campuses, 13 two-year UW Center campuses, the statewide UW- Extension and the UW System Administration.

The budget reduces System General Purpose Revenue (GPR) by $23.9 million in 1995-96 and an additional $19.8 million in 1996-97. The cut will be offset in part by $10.7 million in tuition and application-fee increases.

Significant aspects of the budget-reduction plan include:

- Systemwide, 322 full-time equivalent (FTE) positions will be eliminated.
- $18.3 million (68 percent) of the $26.9 million in administrative and general cuts will come from non-instructional activities.
- Cuts were made according to institutional needs and priorities, and not in an across-the-board fashion.
- 94 percent of the reduction is from salaries and fringe benefits. Reductions in supplies and expenses represent 5 percent, and capital equipment, 1 percent.

Chancellor David Ward says the reductions signify a continuing downward spiral in state funding for the university — a worrisome trend in light of increased state support of public higher education in some neighboring states. "In terms of state support, the future looks no better and could be worse as we move into the next century," says Ward. "Much more than any other UW campus, we are highly leveraged because of the support we receive for our research and outreach programs. I am concerned that this leverage will erode if our state support continues to dwindle.

"As a community, we have to continue to restructure and achieve our goals using our own ideas, and our own ingenuity. We have to continue to crosswire and mesh our systems, facilitating and nurturing alternative resources as we move forward. We will face these challenges together."

"This budget tests our mettle," said Regent Jay Smith of Madison, noting that the board must look for new ways to raise funds.

Regent San Orr of Wausau urged chancellors to maintain standards in student support. For instance, he hopes long lines won't be the norm. "I don't want to treat our students that way," he said. "It's a management challenge, but one I think we have to put before them rather than to simply raise our hands and say, 'fewer resources, longer lines.'"

According to UW System President Katharine Lyall, the total reduction amounts to $214 per student. By comparison, the UW spends about $145 per student for library acquisitions and general-access computing.

"The UW System will be adjusting to the ramifications of this reduction for some time," Lyall said. "These decisions are not inconsequential. Our chancellors, in consultation with faculty and academic staff, have done their best to protect instructional quality and opportunities for students. Where necessary, convenience and speed of response times have been sacrificed to maintain access and quality to instructional services.

"All our constituencies — students, business and continuing education clients among others — will be affected by some aspect of these reductions. That is unavoidable, in light of the size of this cut and the significant reductions in overhead and administrative costs already achieved by the System in recent budgets."

In other matters, the board identified topics to be addressed in its year-long strategic planning study. Although Regent President Michael Grebe of Milwaukee said a narrowed list won't be presented until September, topics include access, tuition and affordability; generating new revenues; technology and instructional technology; role of UW System Administration; effective policymaking and management of the System; issues of diversity, equity, and affirmative action; managing resources in a fiscally constrained environment; and improving interactions with institutions, the Legislature, the governor and within the System.

Three new faces — Jay L. Smith of Madison, Al De Simone of Kenosha and Brigit Brown, a student at UW-La Crosse — have joined the Board, replacing Paul Schilling, Adolf Gundersen and student member Joshua Tregoning, whose terms expired.

✦ IN HONOR OF EXCELLENCE ✦

(Continued from page 7)

the world's most revered scholars of medieval French literature during a period of rapid and decisive change in the field.

According to department chair Elaine Marks, medieval studies has shifted from emphasizing the study of historical linguistics to a science of interpretation: "Douglas Kelly has contributed to these changes while remaining strongly committed to exegesis based on solid and precise philological work, to the specificity of the medieval world view and of the medieval concepts of poetics and rhetoric."

Kelly has devoted the bulk of his critical scholarship to the art of literary composition in the high and late middle ages. He has written extensively on the imagination as source of artistic inspiration in the middle ages; he also investigated the art of medieval French romance.

In addition, Kelly has taught both French and Italian language courses, and has worked with graduate students in the department in medieval literature. He currently serves as adviser to first-year graduate students. He also has chaired the French Graduate Studies Committee and the department's Awards Committee since its inception in 1988. A veteran and past director of the university's Medieval Studies Program, Kelly has lent his expertise to the UW Press, Memorial Library, Graduate School, Institute for Research in the Humanities, and many more. He is Julian E. Harris Professor of French.

A native of Santa Ana, Calif., Kelly earned his B.A. from the University of Southern California, and an M.A. and Ph.D. from UW.

—*Barbara Wolff*

✦ Stanley G. Payne

Professor of History

During his 26 years at Wisconsin, Stanley Payne has emerged as the world's foremost scholar of Spanish and Portuguese history in general, and fascism in particular. The reason, according to department chair Kenneth Sacks, is Payne's combination of "detailed research with a strong underpinning in social scientific theory."

Payne became dean of Iberian scholars with such internationally recognized studies as "Falange: A History of Spanish Fascism," "Politics and the Military in Modern Spain," "Franco's Spain," "The Spanish Revolution," the two-volume "History of Spain and Portugal," "Basque Nationalism," "Fascism: Comparison and Definition," "Spanish Catholicism: An Historical Overview," "The Franco Regime," "Spain's First Democracy: The Second Republic, 1931-1936," published last year, and more.

"Falange," published in 1961, remains in print in two languages. Its companion study, "The Spanish Revolution," currently is in print in three languages following Book World's selection of it as one of its "Fifty Best Books of the Year" in 1970. In addition, Payne's books on Franco universally are hailed as the definitive studies of this important political figure.

However, departmental chair Sacks says that "Fascism: Comparison and Definition" represents Payne's most important contribution. This work creates a comparative approach to European fascist movements by investigating 17 regimes in Italy, Germany, Spain, Portugal, Japan, China, Latin America and South Africa.

"Because Payne is thoroughly engaged intellectually," Sacks notes, "his scholarly accomplishments flow naturally into his pedagogy." Two-thirds of Payne's teaching load is at the undergraduate level, serving history majors and non-majors alike. Payne also has distinguished himself as a graduate adviser — 10 of his former students have published books of their own.

Payne chaired the history department between 1979-82, and has served on many all-campus committees. He held a Hilldale Professorship in 1982, the Jaime Vicens Vives Professorship in 1981, and has been the recipient of numerous fellowships.

Originally from Denton, Tex., Payne received his B.A. from Pacific Union College, his M.A. from Claremont Graduate School and University Center, and his Ph.D. from Columbia University in New York.

—*Barbara Wolff*

✦ Waclaw Szybalski

Professor, McArdle Laboratory for Cancer Research

Far-reaching, seminal, ingenious, profound. These are some of the adjectives colleagues offer to describe Waclaw Szybalski's contributions to science. The Polish-born Hilldale Award winner, a faculty member at the UW Medical School's McArdle Laboratory for Cancer Research for 34 years, stands out today as a major creative force in biological science and technology.

One of Szybalski's discoveries, the "HAT" selection technique, opened the door to the development of monoclonal antibodies, which now serve as indispensable tools for identifying products of new genes and diagnosing diseases such as HIV. His early insights into a simple organism called bacteriophage lambda expanded our understanding of how these organisms control expression of their own genes. More recently, he has applied knowledge gained from his previous work to pioneer a clever method of cutting specific segments out of long strands of DNA. The biochemical technique should aid in pinpointing and analyzing disease-promoting genes and simplify Human Genome Project efforts to explore all of the human genetic material.

Szybalski is also highly respected for the help he has given scientists from Eastern European countries, which in a quiet but substantial way has advanced the entire field of biological science. For more than a decade he has brought Polish and Russian researchers to Madison as colleagues and has collaborated with others at their home institutions so that they could continue their work.

Boundlessly energetic, involved and outspoken, Szybalski has also been the painstakingly fastidious editor-in-chief of the journal *Gene* for the past 17 years.

— *Dian Land*

Excellence in Student Advising

A new tradition started in the College of Letters and Science as Wayne Becker, professor of botany, and Carol Tarr, undergraduate adviser in the Department of English, received the inaugural awards recognizing Excellence in Student Advising. The awards were presented April 25 by Chancellor David Ward at the L&S Faculty Senate meeting.

Becker, on the faculty since 1975, has pioneered such innovative advising methods as meeting students on their own turf (Union South) and helping them write for scholarly publications. Working through the L&S Faculty Advising Service, the Medical Scholars Program and the Molecular Biology Program, he has supported the growth of his students as leaders and individuals, according to students' evaluations.

Tarr, a legend in the English department since 1967, is the author of a handbook for majors and has developed materials for parents outlining possible careers for English degree graduates. She also organizes career programs for majors to help them explore employment options. In addition, she regularly plans trips to American Players Theatre in Spring Green and other cultural events.

A panel of representatives from L&S Student Academic Affairs, graduate and undergraduate advisers, the Faculty Advising Service, and the Dean of Students Office made the selection, assisted by students and a parent. Criteria included exemplary advising practices, sustained contributions beyond the call of duty, developing student potential, working across schools and colleges to meet student needs, and contributing to the improvement of advising services.

— *Barbara Wolff*

International Meteorological Organization Prize

Emeritus Professor Verner E. Suomi, whose work with weather satellites three decades ago helped revolutionize weather forecasting, will receive the prestigious International Meteorological Organization Prize on May 13.

Suomi was cited for establishing the field of satellite meteorology, inventing the spin-scan weather camera, and inventions designed to measure the earth's heat budget. The prize also cites his leadership and cooperation in building international links in the field.

The prize was established by the World Meteorological Organization, an agency of the United Nations, in 1955 to recognize outstanding achievement in the meteorological field. Suomi is the 38th scholar to receive the honor.

Suomi, the founder and retired director of UW-Madison's Space Science and Engineering Center, has been showered with awards in recent years that acknowledge his pioneering work in meteorology and space science.

Suomi said he is gratified by the award, noting that several of those who worked in the early development of his satellites will be at the ceremony.

"What this occasion allows me to do is acknowledge publicly the contributions of the University of Wisconsin, which are manifold — all the way from deans to technicians," Suomi said. "Without their very significant encouragement and help, it never would have come to pass."

Suomi founded and directed the Space Science and Engineering Center from 1953 to his retirement in 1988, and also held joint faculty appointments in the departments of atmospheric and oceanic sciences and soil science.

Often called "the father of weather satellites," Suomi is perhaps best known for inventing the spin-scan camera. The camera was able to take moving satellite pictures and project them to television screens, giving meteorologists their first moving pictures of weather systems.

Inspired by instant replay during football games, Suomi got the idea in the mid-1970s for a powerful interactive computer system called McIDAS, which allows meteorologists to get "instant replays" of satellite images of weather systems, making their movements easier to track. The technology for that idea was later developed by a team of scientists from SSEC.

Suomi said he is most proud of the public impact of his work. Giving the public a visual window into the movement of severe weather led to more caution and respect for the weather's power, he said.

Years ago, Suomi said, there were stories of "hurricane parties" along the Gulf Coast, where groups of friends would take their chances and attempt to ride out a pending hurricane. Some didn't make it, he said.

"They didn't appreciate the storm," he said. "But when you see a hurricane on television and it's coming at you, you get the hell out of there."

Weather satellites connected with people in a very real way, Suomi said, and helped move them from helpless resignation over the weather to preparedness. "You could finally see it and understand it, instead of all that gobbledy-gook about cold fronts and warm fronts and divergence and convergence," he said.

Suomi said he has been a lifelong weather enthusiast, and compared himself to a football fanatic — except his sport is going on constantly, all around him. He has stayed active in research, and is currently working on a project to measure the interaction between the ocean and the atmosphere.

Suomi has won numerous awards, including the prestigious National Medal of Science in 1977 and the Walter Ahlstrom Prize in 1990. The latter award carries a cash prize of $55,500, which Suomi donated to the UW Foundation to support research.

As evidence of his public priorities, Suomi has among his office wall of citations a flattering 1967 letter from a young Army recruit interested in meteorology. Included with the letter, to be earmarked for Suomi's research, was a check for $5.

— *Brian Mattmiller*

Engineering Teaching Awards

Nine professors, two instructors and eight teaching assistants (TAs) were honored with Outstanding Teaching Awards from the Polygon Engineering Council at the College of Engineering. The awards ceremony was part of the organization's annual banquet April 24.

The council is composed of representatives from all the engineering student organizations. Honorees are selected by the engineering undergraduate student body. The recipients are:

- Agricultural Engineering: Richard Straub, professor
- Chemical Engineering: Juan de Pablo, assistant professor; Gary A. Huber, TA
- Civil and Environmental Engineering: William Berg, professor; Charles P. Dunning, TA
- Electrical and Computer Engineering: Gentry Crook, assistant professor; John G. Wohlbier, TA
- Engineering Mechanics and Astronautics: Ronald Thomson, lecturer; Mark J. Fleming, TA
- Engineering Professional Development: Donald Woolston, adjunct assistant professor
- Geological Engineering: Bezalel Haimson, professor; Insun Song, TA
- Industrial Engineering: Stephen Robinson, professor; Siu-Shing Chan, TA
- Materials Science and Engineering: Reid Cooper, associate professor; Mark P. Arvedson, TA
- Mechanical Engineering: Jay Martin, associate professor, Robert L. Gustafson, TA
- Nuclear Engineering and Engineering Physics: Michael Corradini, professor

In addition to the awards program, Polygon promotes engineering campus activities and acts as liaison between administration and students.

— *By Kelly Radloff, College of Engineering*

NEWS TIPS

1•8•4•8 UNIVERSITY OF WISCONSIN–MADISON

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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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4/22/92

During the entire afternoon program, the Plan B Design Studio of Hazel Green, Wis., will demonstrate the making of dinosaur models.

The museum will also put a number of new additions on display for the open house, including the skull of a giant fish, large trilobites and a spectacular specimen of "fools gold" crystals on a black shale matrix.

The UW-Madison Geology Museum is located in Lewis G. Weeks Hall, 1215 W. Dayton St.

###

UTILITY WORK TO DISRUPT PARK STREET TRAFFIC

Utility work for the new Grainger Hall of Business Administration will disrupt traffic on North Park Street between University Avenue and West Johnson for 11 weeks starting May 4.

From May 4 to June 14, the east lanes (northbound) and east sidewalk will be closed. The west lanes will carry one lane of traffic in each direction, and the west sidewalk will remain open.

In the project's second phase, from June 15 to July 20, the east lanes will be reopened with one lane of traffic in each direction. The west lanes will be closed, and there will be no pedestrian traffic between University and West Johnson on either side of North Park. Delivery and handicapped vehicles may enter the south parking area of 905 University Ave., but only from University.

"We urge drivers and pedestrians to use alternative routes or allow extra time to move through the area," said Christopher Gluesing of the university's Planning and Construction Department.

For more information, contact Gluesing at 263-6280.

###

SCIENTISTS NAMED FELLOWS OF AAAS

Three UW-Madison faculty members were among 271 scientists named Fellows of the American Association for the Advancement of Science at the association's annual meeting in February.

Phillip Certain, professor of chemistry and associate dean of the College of Letters

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and Science was honored for his research in physical chemistry, particularly on the electronic structure of molecules, and for his contributions as a teacher and university administrator.

Anthony O.W. Stretton, professor of zoology, was honored for his work in understanding the nervous system, using the nematode as a model.

Verner Suomi, professor emeritus of meteorology, was recognized for his pioneering development of instruments and analysis capabilities that promoted worldwide application of satellites to understanding the atmosphere, oceans and land surfaces.

Founded in 1848, the AAAS is the nation's leading scientific organization.

###

FRIENDS OF INTERNATIONAL STUDENTS TO CELEBRATE 40 YEARS

Madison Friends of International Students, Inc. will celebrate 40 years of service at their annual dinner on May 5 at 5:45 p.m. at the International Building of the Credit Union Center, 5810 Mineral Point Road.

A history of the group's activities will be displayed and David W. Trubek, dean of International Studies at the UW-Madison will be the main speaker.

The all-volunteer organization was formed in 1952 to share home and community life with International students, faculty and families. MFIS, Inc. is sponsored and supported by the University League and a number of other community groups, and they work closely with the University Office of International Students and Faculty.

More information about the group's activities may be obtained by calling 263-4010.

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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 02/22/91

CONTACT: Verner E. Suomi (608) 263-9824, Sanjay S. Limaye (608) 262-9541

NEPTUNE'S NEAR-SUPERSONIC WINDS MAY BE POWERED FROM WITHIN, SCIENTISTS REPORT

MADISON--The driving force behind the winds of Neptune, the most powerful planetary winds ever detected, may originate from deep within the planet, scientists from the University of Wisconsin-Madison reported Friday (Feb. 22).

Writing in the journal Science, a team of UW-Madison scientists suggests that Neptune's winds, enigmatic gales that course around the planet's equator at near-supersonic speeds, arise as heat from the planet's interior literally boils to the surface.

On Earth, winds are generated by solar energy heating the atmosphere or the oceans.

But because Neptune receives only a tiny fraction of the solar energy that the Earth receives, scientists have puzzled over the energy source that could drive the gales that speed around the planet's equator at nearly 1,300 miles per hour.

For the past year, since Neptune's awesome winds were first reported, scientists have searched for causes.

"These winds are the fastest we have measured on any of the planets," said Sanjay S. Limaye, an atmospheric scientist at UW-Madison's Space Science and Engineering Center. "But the question is, what drives them and what sustains them?"

Limaye and UW-Madison meteorologists Verner E. Suomi and Donald R. Johnson

-more-

used images from NASA's Voyager space probe to track the movement of clouds at the top of Neptune's deep, gaseous atmosphere.

The planet's pinkish clouds, composed largely of frozen methane, were used as tracers to determine wind speeds and directions, and to glean clues about the mechanisms that underpin the planet's weather.

Limaye likened the planet to a boiling pot, where heated liquid is conveyed upward through the atmosphere at the equator providing the energy to drive winds 100 times faster than any on Earth.

"You can have the winds even if you turn the sun off," Limaye said. "As far as Neptune is concerned, the sun is not an issue."

The winds, the UW-Madison scientists contend, blow constantly in a belt around Neptune's equator. They are generated by the conservation of angular momentum, where the heated equatorial belt of the planet's deep atmosphere contracts and its speed of rotation increases.

"It's like a skater," said Suomi, a meteorologist and space scientist who has pioneered the study of planetary atmospheres. "When a skater is spinning with her arms close to her body she spins faster. This is essentially what's happening at the equator of Neptune."

The winds around Neptune's equator blow from the east to west, a direction opposite the rotation of the planet itself.

Although the planet's surface winds blow at near-supersonic speeds, the Wisconsin scientists found that they move at a slower pace than the liquid ball that constitutes Neptune's core. It takes 18 to 20 hours for the rotating belt of winds to circumnavigate Neptune. The planet's core rotates once every 16.1 hours.

Neptune's patterns of winds seem to be unlike anything on Earth. According to Limaye, the convective cells that give birth to storms on Earth and the clashing air masses that define much of our weather seem to be absent on Neptune.

Neptune's clouds, the Wisconsin scientists said, are different and more ephemeral than the clouds on the other planets probed by Voyager, but seem somewhat similar to Earth's clouds. For example, other than the Earth itself, Neptune is the only planet where the shadows of clouds, and clouds like those formed on the lee side of mountains can be seen.

Moreover, many of the planet's clouds literally indicate the basic orientation of the planet.

One of Neptune's poles, for example, appears almost as a bull's-eye at the center of concentric rings of clouds. The planet's equator is distinctly marked by a faint, diffuse band of clouds.

Limaye said the model for Neptune's winds also applies to the planet Uranus, Neptune's nearest neighbor in the solar system.

These new insights provided by Voyager into the weather of Neptune and Uranus are essential for a better understanding of the mechanisms that control planetary weather systems, Limaye said.

"On Neptune, we don't see any new physics, but the planet gives us a new appreciation of how and where the fundamental laws of physics are important," he said.

###

-- Terry Devitt (608) 262-8282

Photo available

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10/23/90 UW NEWS

Members of the staff of the Office of Field Experiences will be present to discuss such topics as student teaching and intern programs, application procedures and program requirements.

All students who plan to do their student teaching in 1991-92 are urged to attend one of the sessions. Special education students should attend the Wednesday, Oct. 31 session.

For more information, call Patricia O'Toole at (608) 262-1651.

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Suomi, Verner

SATELLITE SCIENTIST RECEIVES INTERNATIONAL AWARD

Verner E. Suomi, a UW-Madison emeritus meteorology professor, has been awarded the first Walter Ahlstrom Prize, "Technology for a Better Environment," for developing space-based environmental observation systems.

The analytical instruments Suomi developed are used to evaluate the environmental impact of industrial processes on the Earth's atmosphere.

Using satellite technology, Suomi has also studied the Earth's weather systems and weather on other planets.

During his 40 years at the UW-Madison, Suomi helped found the department of meteorology as well as the Space Science and Engineering Center, which he directed for more than 20 years.

He also has held a variety of international leadership roles in weather and space research, and served as the U.S. Weather Bureau's chief scientist.

The award is sponsored by the Finnish Academies of Technology and the Walter Ahlstrom Foundation.

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Finnish Academies of Technology
Awards Meeting, October 19, 1990
Helsinki University of Technology

Professor Jorma Routti

Distinguished Guests of Honor
Members of the Academies
Ladies and Gentlemen

On behalf of the Finnish Academies of Technology I have the pleasure to welcome you to the Awards Meeting of the Finnish Academies of Technology. The theme of the Meeting is "Technology for a Better Environment" and the highlight of the Meeting will be the first International Walter Ahlström Prize.

We have two Academies of Technology in Finland – "Teknillisten Tieteiden Akatemia" and "Svenska Tekniska Vetenskapsakademien i Finland". During the last few years they have combined their forces and efforts in international activities and important domestic topics.

The Finnish Academies of Technology have significantly increased their international activities. We have longstanding close relations with our Scandinavian sister organizations, which are the oldest in the world. Last year we joined the Council of Academies of Engineering and Technical Sciences, which represents academies of some 30 countries. Last year we also founded the Japanese-Finnish Technological Society to enforce links to the new technological superpower of the Far East. And this autumn, as already many times in the past years, we are bringing out a new and improved version of the book "High Technology from Finland" which will serve the wider international interest of the Finnish scientific and university world, industry and commerce, as well as our embassies abroad.

Internationalization is not a goal in itself, rather it is the prerequisite to the solutions of many problems. Scientific world has the longest traditions in harmonious international collaboration. Knowledge is the most important international commodity especially to a small country like Finland. We are very dependent on the access to the new knowledge, since a great majority of new scientific results – more than 99 % – is produced outside our borders. Our own contributions are equally important, however, as a basis of our civilization, competitiveness and acceptance as partners in the international scientific world.

International perspective is necessary in addressing major environmental problems. Airborne and water emissions cross freely national boundaries, and a majority of pollution falling on our soil comes from beyond our borders. Many environmental problems are truly of global nature, especially the prospect of climatic changes due to greenhouse gases emitted to the atmosphere. Earlier this year the Finnish Academies of Technology published a well-received book "Kasvihuoneilmiö, ilmastonmuutos ja Suomi", whose English summary will be presented at the next meeting of the Symposium of the Council of Academies of Engineering and Technical Sciences held next month in Mexico.

Many problems of the environment are caused by the use of inappropriate or inadequate technology. However, technology also provides the means for a better environment. It is clearly more effective and economical to use clean technologies from the beginning, rather than have to spend vast resources to clean polluted environment. Finnish research and industries have provided many important solutions to these problems, such as clean burning techniques using fluidized bed combustion. Their utilization in Finland has reduced emissions significantly, while further reductions are still needed. They have also become the basis of export industry of growing importance and deliveries to many countries around the world, as illustrated by the exhibition arranged in connection of this meeting.

Technology alone cannot respond to environmental problems. Economic and political systems guide the technological development and the other way around. These complex interactions are currently under study by a task force of the Finnish Academies of Technology.

The principal topic of this Awards Meeting is the first International Walter Ahlström Prize. The prize has been made possible by a generous grant by the Walter Ahlström Foundation. The annual prize is awarded for outstanding achievements in technology which contribute to industrial applications in the economic use of energy and raw materials or in minimizing environmental impact. The Finnish Academies of Technology express their gratitude to the Walter Ahlström Foundation for this new and important award, sometimes already called the small Nobel prize in technology. We are also grateful to the distinguished international jury which has lent its prestige and expertise in selecting the winner of the prize.

Earlier today there was a scientific seminar on "Weather Satellite Instrumentation" related to the field of the prize winning work. Space research and technologies illustrate well our topics of today. They are very international in nature and provide a common horizon for all mankind. They also provide effective and accurate means to monitor the environment of our globe. Maybe even more importantly, pictures from high-flying satellites have emphasized more than any other messages the limits and fragility of our blue planet Earth in the vast, open and cold space around, and our responsibility for the well-being of our common and only home. I hope that the Award Meeting of Finnish Academies of Technology today will further enforce these perspectives and the commitments which they call for.

THE FINNISH ACADEMIES OF TECHNOLOGY

Eino Tunkelo

A LOOK AT TECHNOLOGICAL DEVELOPMENT IN FINLAND

Knowledge and research has always been highly esteemed in Finland. During the past two decades, this has been particularly obvious through the rapid growth of resources allotted to R & D. New products have been developed and the international competitiveness of companies has increased. In many areas, Finland is in the forefront of technological development. This is particularly important in the Finnish forest industries and metal and engineering industries which form the backbone of the Finnish national economy. The marked development has been possible through both the industries' own activities and research programs sponsored by the State.

During the 1980s, international industrial competition stepped up. Old methods for increasing competitiveness were no longer sufficient. The opportunities offered by production of scale were used up, and increases in demand did not keep pace with the increased production. Industry actively began to look for new means of competing through determined innovation and R & D.

Today, however, the damage man has done to his environment has grown to the extent that it is threatening the very foundations of industrial activity. This in turn has led to a shift in emphasis, to a sa striving for new effectiveness of production coupled with a minimum of harmful emissions. Naturally, these factors have always been an important part of the development of industrial processes, but, until now, only from a cost-effectiveness point of view. Consumers, too, have up until now been willing to pay a price that includes, for instance, the costs resulting from needless use of energy and waste of raw materials. On the other hand, society has not demanded compensation for the handling of waste and harmful emissions.

All these factors have resulted in a change in the focus for industry. New technologies now being developed may be divided into three areas:
- cleaning technologies
- non-waste technologies, and
- recycling technologies.

Industry has actively gone out to develop new solutions for utilizing both raw materials and energy in the most efficient possible way. Both for production and consumption, the goal is to find methods that minimize pollution and maximize recycling. The avowed aim is to create a new technology, based on a cycle of carbon, water and other matter in nature. The preservation of nature is a condition of existence for industry, as it is for all mankind.

It is becoming quite clear, that Finnish industry has a number of technically and commercially viable solutions within the technologies of cleaning and non-waste of materials. Research and development work has been intensively and fruitfully carried out on a broad front. The primary question now remains: can these opportunities be fully realized?

Finnish Academies of Technology
Awards Meeting, October 19,1990
Helsinki University of Technology

Professor Johan Gullichsen

THE WALTER AHLSTRÖM FOUNDATION

The Walter Ahlström Foundation is a fairly old institution. It was founded already in 1925 by Walter Ahlström, who at that time was president of the A. Ahlstrom Corporation. There was in those days very limited possibilities for young engineers to travel abroad and gain valuable international work experience to be brought back to Finland.

Walter Ahlström understood the great value of research and development to the future competitive capacity not only of his own company but the whole of Finnish industry. The establishment of the foundation and the ruling that scholarships should be given to support young engineers willing and capable to bring to Finland, from abroad, skills of great importance for the development of our industry, was a concrete act of Walter Ahlströms determination to enhance the industrial development of Finland.

It is interesting to note that several out of the hundreds of the original Walter Ahlström Foundation travel stipend recipients have later reached leading positions in the Finnish industry.

Times have changed. Young engineers are today often sent by their employers to gain international experience in the service of their foreign subsidiaries. The Walter Ahlström Foundation stipends have thus in recent years been mainly given to promising postgraduate students aiming at the licentiate or doctor of technology degrees through study in Finland or abroad.

The board of directors of the Walter Ahlström Foundation decided two years ago to establish The Walter Ahlström Prize in an effort to further encourage engineers and scientists to develop their innovative skills. The prize is international and is awarded in recognition of significant technological achievements which enable or will enable industrywide advances in reducing the use of energy and rawmaterials or in minimizing the environmental impact. The task to find a worthy recipient was given to Finnish Academies of Technology.

This occasion marks the beginning of a new phase in the history of the foundation. We have a distinguished first winner of the Walter Ahlström Prize and a number stipendiates to celebrate.

THE FINNISH ACADEMIES OF TECHNOLOGY

PRESS RELEASE October 19, 1990

"THE MINI-NOBEL" OF TECHNOLOGY AWARDED

"TECHNOLOGY FOR A BETTER ENVIRONMENT" AWARD FOR SPACE-BASED REMOTE SENSING OF THE GLOBAL ENVIRONMENT

The scientific front of space-based environmental research was presented in Helsinki today in connection with the awarding ceremonies of the "Mini-Nobel" prize of technology. Professor Verner E. Suomi of the United States received the international Walter Ahlström Prize, Technology for a Better Environment, at the Awards Meeting of The Finnish Academies of Technology.

"Space research and technologies provide a common horizon for all mankind", said Professor Jorma Routti, Chairman of The Finnish Academies of Technology. "They also provide an effective and accurate means of monitoring the environment of our globe. Even more important, pictures from high-flying satellites have emphasized the limits and fragility of our blue planet Earth, and our responsibility for the well-being of our common and only home."

Among the thoughts Professor Suomi expressed in his presentation was the following: "Developing of space instrumentation methods has been exciting and great fun. The technical difficulties were not insuperable, but what caused more problems was the overwhelming amount of information received from satellite pictures. Computers to handle all the information did not exist, and so we had to develop a version of videotape able to save several times the number of pictures than the earlier ones. These tapes are the basics for analysing information and combining it with the data from earth stations and weather scanners.

It was, however, essentially more difficult to convince the authorities to accept these ideas and to include them in space research programmes. "Now that all this has materialized, the data flows in routinely and it is easy to apply both for research and weather forecasting."

The President of The Finnish Academies of Technology, Professor Eino Tunkelo emphasized the responsibility of the manufacturing industries in environmental matters. "Concern for pollution of the environment and the degradation of nature has forced industry to find solutions for more efficient use of energy and materials. Non-waste technologies and recycling principles are being developed to suit all types of production and consumption. We human beings and our technology are part of nature and we can survive only if the biological life stays healthy."

Before the Awards meeting, an exhibiton on Technology for a Better Environment was opened.The computer station, McIDAs, developed by Professor Suomi was shown at the exhibition. McIDAS is a system for analysing satellite pictures at 41 stations around the globe. Several Finnish companies also presented their achievements for the development of technologies for environmental protection.

During the morning a scientific seminar was held with presentations on space reasearch and technology. Speakers included, in addition to Professor Verner E. Suomi, Professor Eero Holopainen of the University of Helsinki, Scientific Director Pekka Kostamo of Vaisala Ltd. and Doctor of Philosophy Erkki Kyrölä of the Finnish Meteorological Institute. In their papers several practical applications of the remote sensing of the global environment were presented.

Suggestions for candidates for
the award came in from all continents

The Finnish Academies of Technology and the Walter Ahlström Foundation awarded the 1990 Walter Ahlström Prize, "Technology for a Better Environment", to Professor Verner E. Suomi in recognition of his pioneering work in the development of space-based environmental observation.

Professor Verner E. Suomi is one of the world's leading developers of space engineering and weather analysis systems. His career at the University of Wisconsin-Madison, first in the Department of Meteorology and then as founder and director of the Space Science and Engineering Center (SSEC), now spans almost forty years. He currently holds the position of senior research scientist at the SSEC, as well as emiritus professor of meteorology.

The Prize Selection Committee bases its award on the following: "The research done and instruments developed under the leadership of Professor Suomi have substantially increased our understanding of changes in the atmosphere and of the factors affecting them. Weather satellite instrumentation methods and interactive weather analysis systems developed by him are being used in conjunction with daily observations for weather forecasts. Furthermore, they enable us to obtain data concerning our planet which can be utilized in reducing the environmental impact of industrial processes."

The international Prize Selection Committee is chaired by Bengt Berg of Sweden, the other members being head of research Heinz Harnisch of Germany, general manager Robert Malpas of the UK, Professor Johan Gullichsen, and Dr Jaakko Pöyry of Finland.

The Walter Ahlström Prize, "Technology for a Better Environment", was jointly initiated by the Finnish Academies of Technology and the Walter Ahlström Foundation. It is awarded in recognition of significant technological achievements that lead to important benefits in industry and thus to the well-being of society. The award amounts to FIM 200,000 and this year it was be presented for the first time. Scholarships from the Walter Ahlström Foundation were also presented to 16 scientists at the Awards Meeting of the Finnish Academies of Technology.

Further information: Professor Eino Tunkelo, Finnish Academies of Technology,
tel. +358-0-694 4260.

Professor Verner E. Suomi
The University of Wisconsin-Madison
October 19, 1990

THE DEVELOPMENT OF THE GEOSYNCHRONOUS WEATHER SATELLITE SYSTEM

On April 1, 1960, the world's meteorological satellite, Television Infrared Observation Satellite (TIROS-1), was successfully launched. TIROS-1 was an immediate success, demonstrating the potential of meteorological observations from space.

This satellite provided instantaneous "snapshots" of existing weather conditions. What was now desired was the ability to "hover" over selected areas to watch weather systems grow and develop. This capability was provided by geosynchronous (or geostationary) satellites that, flying in an equatorial orbit kept up with the Earth's daily rotation. The first such satellite with meteorological instrumentation was the Applications Technology Satellite (ATS-1) launched in December 1966. For the first time, nearly continuous observations of the same area of the Earth could be made. The dimension of time was added to the study of satellite meteorology.

Over the past two decades, the geosynchronous satellites have evolved into sophisticated multiparameter observational platforms.

The concept of using the spinning motion of the spacecraft in concert with a telescope and photomultiplier tube assembly to "paint out" an Earth image was pioneered and developed at the University of Wisconsin.

On December 7, 1966, ATS-1 was launched and subsequently placed into a geostationary orbit over the Pasific.

The ATS-1 spin-scan cloud cover camera (SSCC) system provided for the first time nearly continuous observations of cloud cover patterns over the whole sunlit Earth disk. The assembly could be tilted in discrete steps to produce a north-to-south scan, corresponding to an earth coverage. The east-to-west scan was provided by the spin of the spacecraft itself. At the nominal spin rate of 100 rpm, approximately 30 min were required to scan the Earth, one line at a time.

The success of the meteorological experiments carried onboard the ATS-1 and ATS-3 satellites led to NASA's development of a satellite specifically designed to make atmospheric observations. Two operational prototype sattellites, designated Synchronous Meteorological Satellite (SMS), were launched in 1974 and 1975. These were followed by a series of operational satellites, designated Geostationary Operational Environmental Satellites (GOES), beginning in 1975. They carried instrumentation for visible and i.r. imaging, collection of data from automated remote platforms, relay of weather products (WEFAX), and measurement of a number of characteristics of the near space environment.

The primary instrument on all five spacecraft was the visible/infrared spin-scan radiometer (VISSR). The VISSR was a true radiometer, providing day and night observations of clouds as well as data for the determination of cloud and surface temperatures, cloud heights, and wind fields (via cloud motion in successive images). The two spectral-channel instrument was able to take both full and partial images of the Earth's disk. The spinning motion of the spacecraft provided a west-to-east scan motion while the north-to-south scan was accomplished by sequentially tilting the scanning mirror at the completion of each spin. During each scan, the field of view on the Earth was swept by an array of eight visible-spectrum detectors.

The VISSR output was digitized and transmitted to the NOAA Command and Data Acquisition (CDA) Station.

The early SMS-1, SMS-2, and Goes-1 missions were highly successful, both in terms of data quality and useful lifetime of the primary imaging sensor. The GOES-1 VISSR is, in fact, still useable.

The initial attempts to work with data obtained from the geosynchronous satellites focused primarily on the use of imagery. A wide range of operational users monitored the growth and movement of cloud systems, while researchers mostly used the imagery to give them a general concept of the cloud systems or surface temperature to augment their other data sources.

Interactive systems developed at the University of Wisconsin, NASA, and NOAA permit the time lapse display of enhanced images where the system operators can select what will be measured and have immediate access to the digital data to make the calculations. Quantitative estimates of temperature and moisture profiles, surface temperature, cloud properties, and winds can now be made.

The geosynchronous satellite capability to measure over large areas with very high spatial and temporal resolution makes it the principal satellite system for studying and monitoring rapidly changing meteorological events. These include severe local storms, tropical and extratropical cyclones, frost and freeze conditions, fog, and dust storms.

Future Potential of Geosynchronous Satellites

Major new observing capabilities are possible in geosynchronous orbit. Microwave sounding and imaging could provide temperature and moisture profiles in cloudy areas, improve the profiles in other areas, and determine precipitation parameters. Higher vertical resolution i.r. temperature profiles are feasible by sharply increasing the spectral resolution of the profiling channels.

Ozone measurements can further improve the temperature profiling by estimating the tropopause height. These data could also assist in delineating strong upper tropospheric circulation features (e.g. jet streams). Increasing the spatial and temporal resolution of the imager could lead to substantial improvements in convective cell monitoring, wind determinations from cloud motion, measurements of surface temperature, and low-level moisture estimation.

Earth resource oriented measurements could also be initiated. Other possible sensor candidates include lightning mapping, regional radiation budget surveys where diurnal changes are important, and higher-frequency solar measurements, which would contribute to the climate program.

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

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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-

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

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UW PROFESSOR TO LEAD WEATHER SATELLITE SCIENCE GROUP

MADISON -Professor Steven A. Ackerman has been named director of the Cooperative Institute for Meteorological Satellite Studies at the University of Wisconsin-Madison.

Ackerman is a scientist in the UW-Madison Space Science and Engineering Center, where CIMSS is housed. He also is a professor in the Department of Atmospheric and Oceanic Sciences.

Known as an energetic and dynamic teacher and researcher, Ackerman received a distinguished teaching award from Chancellor David Ward this year. Ackerman also researches the transport of dust and smoke in the atmosphere, and the effects of contrails and other clouds on the atmosphere. He has been a CIMSS researcher since 1987, an UW-Madison professor since 1992 and an associate director of SSEC since 1998.

"I'm excited and enthusiastic about leading CIMSS into the 21st century with continued world-class research in satellite meteorology," Ackerman said.

The satellite research program was founded in 1980. Verner E. Suomi, founder of the UW-Madison's Space Science and Engineering Center, was its first director. Its mission is to develop new techniques that would increase the value and usability of weather forecasts, primarily by employing weather satellite data. Since CIMSS' founding, meteorologists from around the world-from Australia, Germany, England, China, Japan and elsewhere-have collaborated with CIMSS researchers in that effort.

# # #

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CONFERENCE TO FOCUS ON RESEARCH OF ATMOSPHERIC RADIATION

MADISON -- The American Meteorological Society and the University of Wisconsin-Madison will host a scientific conference later this month on atmospheric radiation and its impact on global weather and climate patterns.

Atmospheric radiation is the complex process and interaction of energy in the atmosphere that shapes short and long-term weather and climate patterns.

The 10th Conference on Atmospheric Radiation will be June 28 - July 2 at the Monona Terrace Convention Center. News media are invited to attend the conference and interview the nation's leading experts on satellite observations, numerical modeling and more. The program will highlight advances in understanding atmospheric radiation and the latest scientific findings in this field.

In addition to the scientific discussions, the conference will pay special tributes to the late Verner E. Suomi, the internationally recognized "father of weather satellite systems." Suomi, a UW-Madison professor for more than 40 years, founded the UW-Madison's Space Science and Engineering Center. He's best known for inventing the "spin-scan" camera that enabled weather satellites to image the earth continuously, yielding the weather satellite pictures now familiar to TV-weather watchers around the world.

For a detailed agenda, visit: http://www.confex2.com/ams/ar10/index.htm

To register in advance and/or schedule interviews with the experts, contact Terri Gregory, public information coordinator, UW-Madison Space Science and Engineering Center, (608) 263-3373.

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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

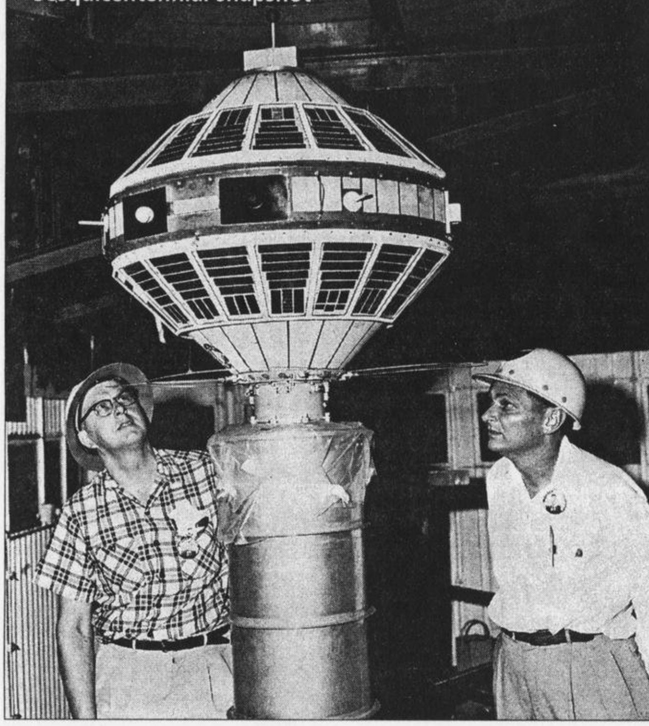

Photo courtesy UW-Madison Archives

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

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UW WEATHER SATELLITE PIONEER VERNER SUOMI DIES

MADISON — Verner E. Suomi, the acknowledged father of modern satellite meteorology, died here today of congestive heart failure. He was 79.

A professor of atmospheric science who spent most of his career on the faculty of the University of Wisconsin-Madison, Suomi is widely credited with the development of the imaging technologies that made modern weather satellites possible.

In particular, he was known for his invention of the spin-scan camera, a device that enabled weather satellites to capture "rock solid" pictures of the earth from geosynchronous orbit. The images, sent back from satellites positioned 25,000 miles above the equator where they orbit at the same speed at which the earth spins, revolutionized weather forecasting and studies of the earth's atmosphere.

His achievements earned him the National Medal of Science, awarded by President Jimmy Carter in 1977; the Franklin Medal in 1984; the Charles Franklin Brooks Award from the American Meteorological Society in 1980; election to the National Academy of Engineering in 1966; and numerous other national and international awards.

"Verner Suomi was a giant of modern science," said UW-Madison Provost John D. Wiley. "His inventions were simple and elegant, and their consequences are ubiquitous. Anyone looking at a satellite image of earth on the evening weather is looking at the product of a rare mind."

-more-

Verner Edward Suomi was born Dec. 6, 1915, at Evaleth, Minn. He received a bachelor's degree from Winona Teachers College, Winona, Minn., in 1938, and his doctorate in meteorology in 1953 from the University of Chicago.

In 1948 he joined the new meteorology department at the University of Wisconsin. While at Wisconsin, he earned an international reputation for his invention of radiation sensing devices and his studies of the Earth's energy budget, the interplay of radiation in the Earth's atmosphere. In 1964 he served as the chief scientist for the U.S. Weather Bureau.

In addition to his work studying the atmosphere of Earth, Suomi was also an accomplished planetary scientist, contributing instrumentation and expertise for numerous probes to the other planets in the solar system. His instruments were integral parts of the Explorer and TIROS satellites as well as the Pioneer probes to Venus.

In 1965, with the late Robert Parent, he founded the Space Science and Engineering Center (SSEC) at UW-Madison. Begun with $500,000 in seed money from the National Aeronautics and Space Administration (NASA), he built SSEC into an international research powerhouse, employing 190 people and attracting scholars from around the world.

The center specializes in studies of the atmospheres of earth and the planets, construction of space flight hardware, and the development of powerful computing and imaging tools for meteorologists and space scientists.

Suomi is survived by his wife Paula of Madison and three children, Eric of Middleton, Wis.; Stephen of Bethesda, Md.; and Lois Young of Houghton, Mich.

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— Terry Devitt, (608) 262-8282

NEWS

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UNIVERSITY OF WISCONSIN–MADISON

News & Information Service
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FOR IMMEDIATE RELEASE 5/9/94

CONTACT: Brian Mattmiller, (608) 262-9772

METEOROLOGY PIONEER SUOMI TO RECEIVE INTERNATIONAL PRIZE MAY 13

MADISON — Emeritus Professor Verner E. Suomi, whose work with weather satellites three decades ago helped revolutionize weather forecasting, will receive the prestigious International Meteorological Organization Prize on May 13.

Suomi was cited for establishing the field of satellite meteorology, inventing the spin-scan weather camera, and inventions designed to measure the earth's heat budget. The prize also cites his leadership and cooperation in building international links in the field.

The prize was established by the World Meteorological Organization, an agency of the United Nations, in 1955 to recognize outstanding achievement in the meteorological field. Suomi is the 38th scholar to receive the honor.

Suomi, the founder and retired director of University of Wisconsin-Madison's Space Science and Engineering Center, has been showered with awards in recent years that acknowledge his pioneering work in meteorology and space science.

Suomi said he is gratified by the award, noting that several of those who worked in the early development of his satellites will be at the ceremony.

"What this occasion allows me to do is acknowledge publicly the contributions of the University of Wisconsin, which are manifold — all the way from deans to technicians," Suomi said. "Without their very significant encouragement and help, it never would have come to pass."

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The awards ceremony will be held Friday, May 13 in Van Hise Hall, 120 Linden Drive, and the guest list includes several past IMO Prize winners from around the world. Also scheduled to attend are UW-Madison Chancellor David Ward, National Weather Service Director E.W. Friday, and the president and secretary general of WMO.

Suomi founded and directed the Space Science and Engineering Center from 1953 to his retirement in 1988, and also held joint faculty appointments in the departments of atmospheric and oceanic sciences and soil science.

Often called "the father of weather satellites," Suomi is perhaps best known for inventing the spin-scan camera. The scanning camera was able to take moving satellite pictures and project them to television screens, giving meteorologists their first moving pictures of weather systems.

Inspired by instant replay during football games, Suomi got the idea in the mid-1970s for a powerful interactive computer system called McIDAS, which allows meteorologists to get "instant replays" of satellite images of weather systems, making their movements easier to track. The technology for that idea was later developed by a team of scientists from SSEC.

Suomi said he is most proud of the public impact of his work. Giving the public a visual window into the movement of severe weather led to more caution and respect for the weather's power, he said.

"Probably more lives have been saved simply by the effectiveness of the communication," Suomi said.

Years ago, Suomi said, there were stories of "hurricane parties" along the Gulf Coast, where groups of friends would take their chances and attempt to ride out a pending hurricane. Some didn't make it, he said.

"They didn't appreciate the storm," he said. "But when you see a hurricane on television and it's coming at you, you get the hell out of there."

Weather satellites connected with people in a very real way, Suomi said, and helped move them from helpless resignation over the weather to preparedness. "You could finally see it and understand it, instead of all that gobbledy-gook about cold fronts and warm fronts and divergence and convergence," he said.

Suomi said he has been a lifelong weather enthusiast, and compared himself to a football fanatic — except his sport is going on constantly, all around him. He has stayed active in research, and is currently working on a project to measure the interaction between the ocean and the atmosphere.

Suomi has won numerous awards, including the prestigious National Medal of Science in 1977 and the Walter Ahlstrom Prize in 1990. The latter award carries a cash prize of $55,500, which Suomi donated to the UW Foundation to support research.

As evidence of his public priorities, Suomi has among his office wall of citations a flattering 1967 letter from a young Army recruit interested in meteorology. Included with the letter, to be earmarked for Suomi's research, was a check for $5.

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— Brian Mattmiller, (608) 262-9772

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Suomi, Verner/satellite.eps

Verner Suomi (L) with early weather satellite instrument.

Photo by: Courtesy of UW-Madison Archives
Date: 1959 File#: 9806-138-13

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Release: Immediately 9/22/88

CONTACT: Terri Gregory (608) 263-3373

SUOMI WINS NEVADA SCIENCE MEDAL

MADISON--Verner E. Suomi, the pioneering University of Wisconsin-Madison meteorologist and space scientist, has been selected by the University of Nevada's Desert Research Institute to receive the first-ever Nevada Medal.

Suomi was cited for his invention of the spin-scan camera, a satellite-borne device that allows scientists to view the Earth and its weather from space.

The UW-Madison scientist, an emeritus professor of meteorology and a co-founder of the UW-Madison Space Science and Engineering Center, was selected from a field of 29 candidates nominated by the nation's top universities and research institutions.

The award will be presented to Suomi at an Oct. 5 ceremony in Las Vegas.

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-- Terry Devitt (608) 262-8282

Francis Bretherton

Verner Suomi

Suomi to retire from SSEC

WI. Week 7/27/88

By Terry Devitt

Verner E. Suomi, the pioneering space scientist and meteorologist, said this week that he will step down as director of the UW–Madison's Space Science and Engineering Center (SSEC).

The 72-year-old Suomi, who co-founded the center in 1965 with the late UW–Madison electrical engineer Robert Parent, will turn the reins of the center over to Francis P. Bretherton, an internationally acclaimed meteorologist and a former director of the National Center for Atmospheric Research (NCAR) in Boulder, Colo.

Suomi has been the first and only director of the space science 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 also has developed devices to probe the atmospheres of the planets Venus and Jupiter.

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 the development of McIDAS, a powerful interactive computer system that allows researchers and forecasters to manipulate satellite images and other weather information much as television sportscasters use instant replays.

"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."

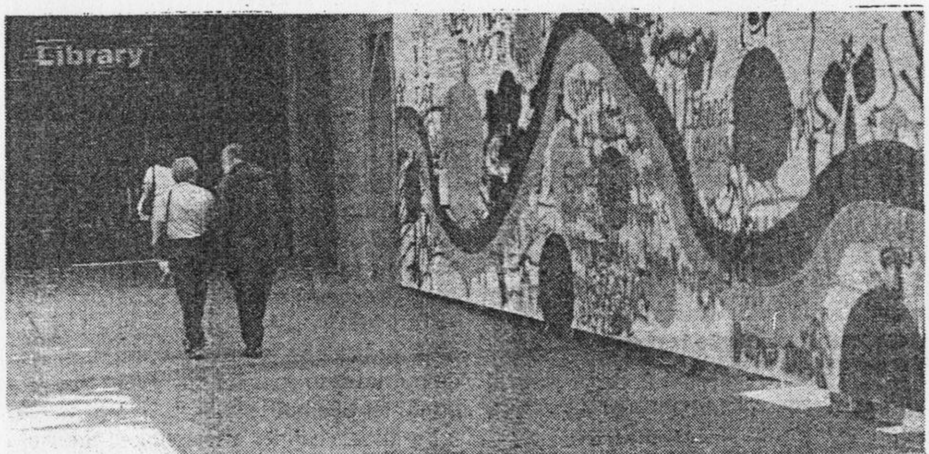
Now an emeritus professor of meteorology and environmental studies, Suomi plans to continue his research.

Suomi's successor, Francis Patton Bretherton, 53, comes to UW–Madison from the National Center for Atmospheric Research (NCAR) where he was a senior scientist. He will assume the directorship of SSEC in late August.

Bretherton was the director of NCAR from 1974 to 1980 and served as president of the University Corporation for Atmospheric Research in Boulder, Colo., from 1973 to 1980. From 1969 to 1974 he was a professor in the department of earth and planetary sciences at Johns Hopkins University where he also was chief scientist at the Chesapeake Bay Institute.

He was educated at Cambridge University and has authored or contributed to more than 60 scientific papers.

Bretherton has served on numerous committees and boards, including 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. ■



FILLED WITH GRAFFITI, the State Street mall wall will be painted by an art class this fall.

State Street mall wall scheduled for facelift

by Barbara Wolff

WI. Week 7/27/88

Members of a UW–Madison art class plan to turn the 10-foot-high plywood wall around the Memorial Library construction site into a work of art this fall.

The fence, which runs for 200 feet down the State Street mall, has become a prime target for graffiti since Kraemer Brothers Construction erected it earlier this summer to begin work on a $12.9 million, eight-story addition to Memorial Library.

Mel Butor, the UW–Madison art professor whose class last winter painted a mural in the Vilas Zoo's South American exhibit, said the architect of the library construction project has expressed interest in the idea of a class painting on the wall in fall.

"I'm not sure about the mural's content, though," Butor said. "The company may have a theme in mind. If they don't, we'll just let the students make the decision," governed, he added, by the boundaries of good taste.

Emma E. Macari, assistant director of the campus planning and construction office, has received complaints about certain sentiments expressed on the wall. She said there have been several requests that the wall be painted over.

However, Macari said a large, blank plywood wall is too tempting to keep clear long, although Kraemer Brothers paints over it periodically. If the university did the work, "it would cost $356 each time we painted," she said.

Kraemer Brothers erected plywood instead of chain link to guard against flying concrete chips from the project. ■

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Release: Immediately 5/18/88

UW-MADISON NEWSBRIEFS

UW-MADISON FACULTY, STAFF STUDENT HONORS LISTED

-- GEORGE MOSSE, history professor, was one of five scholars awarded the 1988 Goethe Medal this spring in Munich, Germany. Mosse, who was born in Berlin in 1918 and left Germany with his parents in 1939 to escape persecution by the Nazis, has written extensively about the roots of the Nazi ideology. The Goethe Institute praised him for his efforts on behalf of the continuation of German-Jewish dialogue.

Mosse was the only American honored this year by the institute.

-- VERNER E. SUOMI, emeritus professor of meteorology and director of UW-Madison's Space Science and Engineering Center, has been elected to honorary membership in the American Meteorological Society (AMS).

The honorary membership is the highest award given by AMS and has been conferred on only 44 people in the 69-year history of the society.

-- W. LEE HANSEN, professor of economics, was awarded a Fulbright grant for 1987-88 to lecture and conduct research in Australia. He serves as a salary consultant to the American Association of University Professors and has done research on the effect of federal student financial aid programs.

-- Professor THOMAS M. LILLESAND has been awarded the Earle J. Fennell Award by the American Congress on Surveying and Mapping. Lillesand, director of the Environmental Remote Sensing Center at UW-Madison, was cited for his contributions to education in surveying and mapping sciences.

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Band concerts to feature guest artists

WI. Week 4/6/88

Nationally known trombonist Chris LeDain will be the featured guest artist Friday and Saturday (April 8 and 9) for the UW Varsity Band's annual Field House concerts, Director of Bands Mike Leckrone has announced.

LeDain has been a regular performer in Broadway and Las Vegas shows for several decades and has appeared on television with such celebrities as Jackie Gleason, Ed Sullivan and Bill Cosby. She has been a member of the musical group "Your Father's Mustache" since 1973 and currently works out of the Philadelphia area. LeDain is a native of Appleton, Wis.

Leckrone said LeDain will perform solo renditions of the popular songs *Just A Closer Walk With Thee* and *Sweet Georgia Brown*. She also may perform a selection or two with guest trumpeter and band alumnus Grant Manhart.

Manhart, who has performed in the national touring company for Dream Girls and with the Buddy Rich band, will play a medley of Harry James classics. Two members of the band also will be featured as soloists. Trumpeter Roxanne Vrooman will perform *MacArthur Park*, while trumpeter Jon Linker will perform Chic Corea's, *La Fiesta*.

Leckrone guarantees the performances will be highlighted by the band's usual theatrical flair and spirited enthusiasm. Also on tap are an array of special effects, including an extensive light show, indoor fireworks and a gravity-defying stunt by Leckrone that may top last year's act in which he was beamed down to stage Star Trek style.

"I promise the end of the show will be an assault on the senses," Leckrone said. "It'll be Vaudeville, Broadway, Las Vegas, half-time, the circus and a Charlie Chaplin comedy all rolled into one."

Tickets for the two shows are still available at the university's Athletic Ticket Office, 1440 Monroe St., and Vilas Hall Box Office, 821 University Ave. Prices for Friday's show are $5 and $6, with tickets selling for $6 and $7 on Saturday. UW–Madison students receive a $1 discount with presentation of a validated student I.D.

For further ticket information, phone 263–6347. ■

Crazylegs Run set for April 23

WI. Week 4/6/88

Runners will take to the streets of Madison Saturday, April 23, for the Seventh Annual Crazylegs Run/Walk, sponsored by the university and local businesses to raise funds for the UW Athletic Department. The five-mile run and two-mile walk will begin at 10 a.m. at the Capitol Square and continue to Camp Randall Stadium.

Runners and walkers are encouraged to register early for the race. The registration fee is $8 through April 11, and $10 after that date. The fee includes a 1988 Crazylegs T-shirt, refreshments, entry to the spring UW football scrimmage that afternoon, and a drawing for door prizes. To register or obtain more information on the run or walk, contact the UW Athletic Department at 262–1866.

Volunteers are needed to assist with the race at the starting and finish lines and at water stops. They also are needed to serve as course marshals along the route and to assist with data entry at the stadium. All registered volunteers also will receive the T-shirt and entry to the spring football game. People interested in volunteering should contact Elaine Penpek, 231–1505, or the UW Athletic Department, 262–1866. ■

WI. Week 4/6/88

Moss named chair of physiology

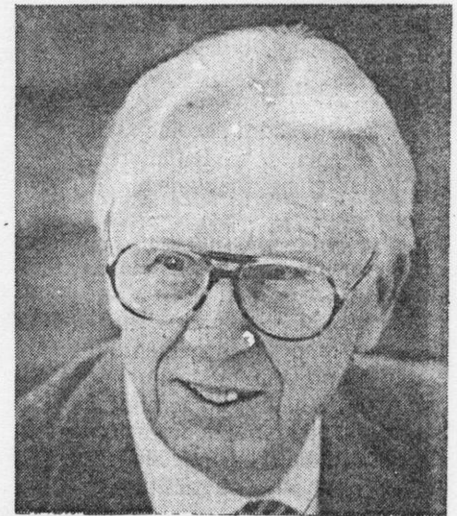
Physiology Professor Richard Moss has been named chair of the department of physiology in the UW Medical School.

Moss is highly-regarded in his areas of research, which include the physiology, biochemistry and biophysics of heart, smooth and skeletal muscle contraction and the apparatus and instrumentation for biomechanical measurement.

Moss joined the UW–Madison faculty in 1979 after post-doctoral research in the Department of Muscle Research of the Boston Biomedical Research Institute. He received his undergraduate degree in biology from UW–Oshkosh and a Ph.D. in physiology and biophysics in 1975 from the University of Vermont.

He is the author or co-author of more than 75 scholarly articles and abstracts and is on the editorial boards of three national journals in his field.

He will become department chair April 1. ■



Verner Suomi

Suomi honored

WI. Week 4/6/88

Verner E. Suomi, emeritus professor of meteorology and director of UW–Madison's Space Science and Engineering Center, has been elected to honorary membership in the American Meteorological Society (AMS).

The honorary membership is the highest award given by AMS and has been conferred on only 44 people in the 69-year history of the society.

Suomi, who taught meteorology at UW–Madison from 1948 to 1986, was cited for his many contributions to the study of weather. The award was presented at the AMS Conference on Polar Meteorology and Oceanography held last week in Madison.

Acknowledged as the "father of the weather satellite," Suomi is known for his invention of the spin-scan camera, a device that made the viewing of the earth from a geostationary satellite possible and that is still used today.

He also is recognized for his conceptualization of a satellite instrument used since 1984 to measure water vapor and temperature in the atmosphere. Moreover, he conceived and helped develop McIDAS, a powerful interactive computer system that allows scientist to manipulate satellite images and other weather information. ■

Radar system could end use of weather balloons

WI. Week 4/22/87

by Jeff Gregory

A new radar system under development by a university-industry research group may spell the end for the weather balloon and dramatically improve weather prediction, according to UW–Madison researchers.

William P. Birkemeier, UW–Madison professor of electrical and computer engineering, has been working with the Milwaukee-based Astronautics Corp. to begin moving the new device, called a wind profiler, into production and onto the market.

"The weather balloon is about to become obsolete," he said. "The wind profiler measures the wind right over your head—something we couldn't do before."

Currently, most information about high-altitude winds is gleaned from balloons released twice a day from a hundred stations across the country. This device, instead of tracking balloons with radar as they move with the wind, tracks the wind itself by bouncing its beams off the water molecules caught up in breezes.

A major advantage, said Birkemeier, is that information about high-level wind speeds can be obtained hourly rather then twice a day. Such information is particularly important to rocket launches. NASA recently began re-examining Birkemeier's theory that wind sheer—sudden and powerful wind velocity changes undetected by meteorologists—contributed to the January 1986 Challenger disaster.

The idea of the wind profiler, which Birkemeier describes as a "forest of TV antennas" about half the size of a football field, has been around for almost 20 years. The team's new version of the profiler required major improvements in radar detecting strategies and the computers needed to cope with the data produced by the system.

Birkemeier developed a method of computer-enhanced radar pulses that helps screen out such interference as airplanes, which had been a significant problem in previous wind-profiler designs. The system also corrects for "range ambiguities," when the radar interprets distant objects as being nearby.

Radar emits radio signals in short bursts and records the patterns reflected by an object. By changing the signal so that each pulse is different from the rest, the interference can be weeded out, he said.

A computer developed at Astronautics specifically for the device makes the profiler a reality. According to Verner E. Soumi, UW–Madison professor emeritus of meteorology and now chief scientist at Astronautics, processing the vast quantities of data produced by the wind profiler is a big job.

"Automating, making all this data available in real time definitely has been one of the major improvements," he said.

Although some meteorologists are not yet convinced of the profiler's reliability, Soumi is confident that "by and large most are looking forward to our data."

Jerry R. Normberg, project coordinator for the wind profiler at Astronautics, said each profiler is run by a separate computer. Data from satellites and the various stations are then collated at a central location. The National Oceanic and Atmospheric Administration is currently operating five profilers experimentally in Colorado and has plans to spread 30 or more from the Rockies to the Appalachians by the early 1990s.

All three researchers agree that the profiler will be much more economical than the balloon stations.

Birkemeier believes there is money to be made in wind profilers, and millions of dollars in government contracts are now the focus of industrial competition.

"Everybody has now gotten into the act because it's been proven to work and the world needs more accurate wind measurement," he said. ■

RESEARCHERS EXAMINE DATA on high-level winds generated by the wind profiler, the forest of antennas seen in the background. From left are Verner E. Suomi, UW–Madison emeritus professor of meteorology; Jerry R. Normberg, project coordinator for the wind profiler at Astronautics Corp., and William P. Birkemeier, UW–Madison professor of electrical and computer engineering.

—University News Service photo

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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 6/5/87

REGENTS AFPROVE EMERITUS, DISTINGUISHED SERVICE STATUS

MADISON--The UW System Board of Regents approved emeritus and distinguished service designations for faculty and staff members at University of Wisconsin-Madison Friday (June 5). Those receiving emeritus status include:

John W. Anderegg, physics/biophysics; Charles E. Anderson, meteorology; Laurens Anderson, biochemistry; Frank H. Attix, medical physics/human oncology/radiology; Max L. Baeumer, German/Humanities Institute for Research; David T. Berman, veterinary science/bacteriology; Reid A. Bryson, environmental studies/geography/meteorology; R. Keith Chapman, entomology;

Ingrid H.J. Clareus, Scandanavian studies; Jack A. Clarke, library and information studies; Frances Z. Cumbee, physical education and dance; Charles H. Davidson, electrical and computer engineering/general engineering/computer science; Jack C. Ferver, continuing and vocational education/education resources and services/Extension; Lemuel A. Fraser, zoology; Robert L. Grilley, art; Donald J. Hagedorn, plant pathology;

Eugene Herrling, plant pathology; Edward L. Kamarck, continuing education in the arts; Joseph F. Kauffman, educational administration; Norma J. Kolthoff, nursing; Theodore T. Kozlowski, natural resources, forestry; E. Paul Lichtenstein, entomology; Hal Lotterman, art; James R. Love, soil science/Extension; James A. Marks, general engineering/industrial relations;

Elizabeth C. Miller, human oncology; Lavern E. Moll, art; Robert F. Patton, plant pathology; Kay H. Petersen, physical education and dance; Louis R. Rossi, French and Italian; John A. Schoenemann, horticulture/agricultural economics (also Extension); Irving Shain, chemistry; Robert W. Siegfried, history of science; Stephen C. Smith, agricultural economics/administration/research division/natural resources division;

Verner E. Suomi, environmental studies/soil science/Space Science and Engineering Center/meteorology; William L. Williamson, library and information studies; Vivian I. Wood, social work/women's studies; H. Edwin Young, economics; Marie J. Zimmer, nursing academic affairs/nursing service.

Those receiving distinguished service status:

John R. Davis, agronomy; Lawrence E. Halle, university housing; Robert G. Heideman, educational placement and career services; Dorothy Hill, international studies and programs; Irene M. Ilgen, zoology; Elizabeth J. Levine, psychology; Harry Ludwig, Medical School research program; Ralph J. Martens, business services/accounting; Helen U. Meyer, zoology; Charles F. Quinn, education student services.

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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 4/16/87

CONTACT: William Birkemeier (608) 262-3131

RADAR SYSTEM TO IMPROVE WEATHER PREDICTION

By JEFF GREGORY
University News Service

MADISON--A new radar system under development by a university-industry research group may spell the end for the weather balloon and dramatically improve weather prediction, according to University of Wisconsin-Madison researchers.

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-- Jeff Gregory (608) 262-9772

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Release: Immediately 10/9/86

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

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.

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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."

###

-- 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 7/16/86

CONTACT: Verner E. Suomi (608) 262-6172, or Terri Gregory (608) 263-3373

PROFESSOR SUOMI RETIRES

By INGA BRYNILDSON

University News Service

MADISON--"The father of weather satellites" -- Verner E. Suomi has added "emeritus" to his title as professor of meteorology at the University of Wisconsin-Madison, a post Suomi occupied since 1948.

Suomi will continue on a half-time appointment as director of UW-Madison's Space Science and Engineering Center (SSEC) which he founded in 1966.

Meteorology department chairman John A. Young likens Suomi's energy and professional enthusiasm to a spring cyclone; "He's a brainstormer."

Suomi's brainstorming precipitated inventions that earned him, among other honors, the National Medal of Science presented by President Jimmy Carter at the White House in 1977.

Suomi's best-known invention, the spin-scan camera, is the basis for weather satellite imagery throughout the world. Suomi designed the original camera in 1963. It allows scientists to view weather systems every few minutes to measure changes in air motion, clouds, rainfall and atmospheric pollution.

The product of another of Suomi's brainstorms displays the satellite images on a television screen where they can be interpreted by computer.

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McIDAS (Man-computer Interactive Access System), developed by Suomi's colleagues at UW-Madison, allows satellite images to be used to forecast weather instead of studying what happened after the fact.

"Before McIDAS we had to wait to develop the satellite images on film," Suomi recalled. "There had to be a better way. I got the idea by seeing an instant replay during a football game and thought, 'what we need is an instant replay of those weather pictures.'"

Not only is McIDAS fast, but it allows precise computer measurement of the huge amount of information contained in each satellite image.

"There's so much information in these pictures that without the computer, analyzing them was like trying to get a drink from a fire hydrant," said Suomi.

A version of McIDAS is used for forecasting at the National Hurricane Center. For Suomi, that's when his brainstorming really pays off.

"Last year, when Hurricane Elena was buzzing around the Caribbean, no one knew just where it was headed. It was Labor Day weekend and thousands of people were going to the beach. Thanks to our satellite and McIDAS we were able to send the pictures to Florida. The people were able to see what a roaring monster that storm was, so they stayed home. They may have been disappointed, but only three lives were lost, and there could have been thousands."

Suomi's work has earned him worldwide acclaim. In addition to the National Medal of Science, he received the Franklin Medal in 1984. Previous winners include Thomas Edison, Orville Wright and Albert Einstein, among others.

The National Aeronautics and Space Administration awarded Suomi its 1980 Exceptional Scientific Achievement Medal for his contributions to the Pioneer Venus Project.

Born in Eveleth, Minn., Suomi received his undergraduate education at Winona Teachers' College, Winona, Minn. He earned his doctorate at the University of Chicago. Recently he was awarded the National Scholar Award of Phi Kappa Phi, presented nationally only once every three years.

Reflecting on his career, Suomi said a good scientist must possess intelligence and curiosity.

"The hardest thing is asking the right questions," he said. "You need to ask your questions so well no one needs to ask them again.

"I agree with Benjamin Franklin, the pursuit of academics should be 'useful knowledge' that helps people. I don't think there's a better job in the world."

###

-- Inga Brynildson (608) 262-9772

uw news

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

Release: Immediately 5/19/86

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(NOTE TO EDITORS AND NEWS DIRECTORS: For more information on the international weather satellite symposium being held this week on the UW-Madison campus, contact Terri Gregory at (608) 263-3373, or Inga Brynildson at (608) 262-9772.)

SUOMI HONORED FOR 50 YEARS OF EXCELLENCE

By INGA BRYNILDSON
University News Service

MADISON--Verner E. Suomi has brainstorms like the month of June has thunderstorms.

His brainstorming over the last 50 years has precipitated inventions that have earned Suomi the reputation as the father of weather satellites. It's also earned him, among other honors, the National Medal of Science, presented by President Jimmy Carter at the White House in 1977.

World experts in the field of weather satellites are meeting at University of Wisconsin-Madison this week (May 21-23) to honor the UW-Madison meteorology professor and director of its Space Science and Engineering Center.

Suomi's best-known invention, the spin-scan camera, is the basis for weather satellite imagery throughout the world. Suomi designed the original camera in 1963. It allows scientists to view weather systems every few minutes to measure changes in air motion, clouds, rainfall and atmospheric pollution.

A version of the camera, the spin-scan radiometer, was aboard the weather satellite destroyed by the malfunction of a Delta rocket earlier this month.

The product of another of Suomi's brainstorms displays the satellite

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images on a television screen where they can be interpreted by computer. McIDAS (Man-computer Interactive Access System), developed by Suomi's colleagues at UW-Madison's Space Science and Engineering Center, allows satellite images to be used to forecast weather instead of studying what happened after the fact.

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According to Suomi, "gadgetry" has played a major role in the evolution of the science of meteorology. He traces the start of the U.S. Weather Bureau -- now the National Weather Service -- for which he served as chief scientist in 1964, to the commercial exploitation of the telegraph.

"It was the first time weather information could be communicated quickly nationwide, so it made possible the first national weather maps," he said.

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During World War II, Suomi trained military officers in weather prediction. "Weather information was vital to the war effort. If the airport was fogged in when the boys came back from a run, then there would be tragedy," he recalled.

Suomi, who joined the UW-Madison faculty in 1948, is currently trying to get a sophisticated wind-profiler radar network located in the Madison vicinity. It would, he said, enhance the accuracy of local weather forecasting.

But Suomi hopes technology has its limits. "Maybe it's a blessing that we are not able to control the weather, because we do not have the wisdom or judgment to decide how to control it."

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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 3/26/86

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UW-MADISON ENGINEER SUSPECTS WIND SHEAR HAD HAND IN SHUTTLE DISASTER

by INGA BRYNILDSON
University News Service

MADISON--A 70 mile-per-hour change in wind velocity in less than half a second may have helped trigger the Space Shuttle Challenger explosion, according to William P. Birkemeier, a University of Wisconsin-Madison wind radar expert.

Birkemeier began forwarding his suspicions to NASA shortly after the Jan. 28 disaster. Last Friday, a NASA official addressing the presidential commission investigating the shuttle explosion, said "busy winds" buffeting the shuttle high over Florida may have helped cause the flame leak by reopening a booster rocket seal that apparently was damaged on launch but had since closed.

Experts said the flame burned a 45-square-inch hole in the booster rocket.

Birkemeier, a professor of electrical and computer engineering and former chairman of the department, said the leak in Challenger's right booster rocket corresponded with its entry into a shear zone where 84 mph winds placed 400,000 pounds of pressure on the shuttle. Four-tenths of a second later, the shuttle broke through the zone into calm air and 14-mph winds.

Birkemeier deduced the wind speeds by examining atmospheric data on the McIDAS weather research computer system at UW-Madison's Space Science and Engineering Center.

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"It would appear that the booster leak was caused by the sudden deceleration of the rocket as it flew through the shear zone," Birkemeier said. According to Birkemeier, the shuttle encountered the shear 60 seconds into its ill-fated flight.

In a letter to Richard Feynman, a member of the president's investigating commission, Birkemeier noted, "Sixty seconds, of course, is close to the point of maximum aerodynamic stress, and coincides closely with the instant the right booster failed."

Birkemeier said he was told by a Rockwell International official that Challenger had veered eight degrees to the north of its programmed flight path at the precise time it would have entered the shear zone. "This was to compensate for the 84 mph wind," Birkemeier said.

He also learned that the shuttle shifted back three degrees to regain its path as it broke out of the shear. According to Birkemeier, this steering action would have placed an additional 200,000 pounds of outward force on the bottom section of the booster where it attaches to the main fuel tank. This is the part of the booster rocket where the suspect O-rings are located, he said.

Birkemeier calculates that the lower segment of the right booster received another 25,000 pounds of inward force caused by the excessive angle of the vehicle as it decelerated when it entered the calm air above the shear.

"This would have tended to buckle the booster at the attach point," helsaid.

Birkemeier said he wondered "whether it would have come loose when it did if this 200,000 pounds of steering force hadn't been applied at that point. In which case, the shear is responsible for the accident, not the O-rings, not the design of the booster, but the fact that the vehicle flew through a wind shear."

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Birkemeier said he doesn't know whether the National Aeronautic and Space Administration (NASA) knew about the wind shear before the launch. "NASA sent up weather balloons three hours before the launch. But a wind shear could develop in that amount of time."

Verner E. Suomi, director of UW-Madison's Space Science and Engineering Center, says Birkemeier's wind shear hypothesis is quite plausible. "The big scale shear we agree on. I get agreement on his explosion cloud exactly," Suomi said.

Birkemeier first suspected a wind shear was responsible for the shuttle explosion, which killed seven astronauts, after viewing videotapes of the Jan. 28 launch.

"The tapes show a sharp right-angle jog in the smoke trail which looks suspiciously like wind shear."

Birkemeier then analyzed satellite photographs of weather conditions at Cape Canaveral on UW-Madison's Man-Computer Interactive Data Access System (McIDAS). McIDAS is a state of the art computerized imaging system that allows scientists to enhance and manipulate satellite pictures and other weather data.

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-- Inga Brynildson (608) 262-9772

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

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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

uw news

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

Release: Immediately 1/23/86

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After 1/26: Verner Suomi (608) 262-6172, Larry Sromovsky 263-6785

UW-MADISON SCIENTISTS WAITING FOR A CLOSE ENCOUNTER

MADISON--Three University of Wisconsin-Madison scientists at Jet Propulsion Laboratory in Pasadena, Calif., are awaiting a close encounter of the planetary weather kind.

Friday (Jan. 24), when the space probe Voyager 2 makes its closest pass to Uranus, will represent the best chance for Verner Suomi, Lawrence Sromovsky and Robert Krauss of UW-Madison's Space Science and Engineering Center to see what sort of weather surrounds the solar system's seventh planet.

"So far, a banded structure and a number of smaller scale features are observable," said Sromovsky, leader of the center's planetary meteorology group. He said early Voyager images received by the California lab indicate wind sheer and varying wind speeds, leading to hope that some secrets of the planet's atmospheric circulation will be unveiled.

The three scientists will bring Voyager images to the Space Science and Engineering Center here to analyze them on McIDAS, a sophisticated image processing and analysis system. Center scientists already have analyzed Voyager images of Jupiter, Saturn and Titan, and found different atmospheric patterns on each.

Suomi is principal investigator on the $666,000, NASA-funded project.

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-- Terri Gregory (608) 263-3373

PIONEER VENUS II (Multiprobe)

THE UNIVERSITY OF WISCONSIN-MADISON ROLE

Three identical "net flux radiometers," developed at the UW-Madison Space Science Center, will be aboard the three small probes scheduled to pierce the Venusian atmosphere Dec. 9.

The radiometers will operate for about 58 minutes after their protective covers are opened about 43 miles above the planet. The atmospheric data they send back will be recorded by receiving stations in Chile and Australia, before being transferred to researchers at UW-Madison and elsewhere.

Verner E. Suomi, director of the Space Science Center, will be the principal investigator in an analysis aimed at locating and mapping points in Venus' atmosphere that radiate unusual amounts of heat or absorb unusual amounts of energy from the sun. A knowledge of atmospheric heat distribution, which powers the circulation of the atmosphere on both Earth and Venus, is a major step towards understanding a planet's climate.

Professor Suomi, an internationally recognized authority on atmospheric circulation, was involved in a study of photographs of the Venusian atmosphere and cloud patterns taken during a flyby mission in 1974. That study indicated an atmosphere made up largely of carbon dioxide and containing many sulphuric acid droplets.

Selection of the UW-Madison proposal to build as well as design the radiometers is quite unusual. NASA usually contracts with outside companies to construct instruments after they are designed by university scientists. The main reason for this is that few universities have the technical personnel and equipment to carry out such complex work.

Design work on the Venus probe instruments began in October 1973. The completed radiometers were delivered in April 1977.

SOME KEY QUESTIONS

+Why did Venus, in many ways Earth's twin, evolve into a world of searing heat and deadly atmosphere while the Earth luxuriates in a climate friendly to life?

+What can the atmosphere of Venus tell us about the future of our own, considering increases in our air of carbon dioxide and sulphuric acid?

+If Venus is as dry as it seems, where did the water (if any) go?

+What makes the Venusian "weather machine" work?

+Why is the planet so hot?

+What are the clouds and atmosphere really made of?

Principal investigator: Verner E. Suomi (608) 262-6172
Acting program manager: Evan E. Richards (608) 262-5938
NASA audio report on status of mission: (415) 968-5600

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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 9/9/85

CONTACT: Glenn Watts (608) 263-2509

SALARIES LISTED FOR TOP-PAID UW-MADISON FACULTY

MADISON--The University of Wisconsin-Madison Monday (Sept. 9) released the names of top-paid faculty members in response to demands by the Madison newspaper, The Capital Times. The information is available to the public under Wisconsin's open records laws.

According to figures released by the UW-Madison Office of Budget, Planning and Analysis, there are 674 names on the list of faculty who, as of Jan. 1, will make more than $49,000 a year. The number represents 30.6 percent of the total faculty, according to the figures.

The highest-paid faculty members also earn the greatest amounts in research grants. A study conducted by the budget office last year revealed that the school's 50 highest-paid non-medical faculty brought in $48.3 million in grant money. The 10 highest-paid faculty accounted for $20.6 million of that amount, while their salaries totaled $750,856.

Some top faculty members, including Professor Hector DeLuca, who receives the highest faculty salary, earn little or no salary from state taxes. Most of DeLuca's salary is derived from an endowment left to the university by UW-Madison biochemist Harry Steenbock.

State funding in 1984-1985, the most recent period for which figures are

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available, accounted for 34.6 percent of UW-Madison's total budget of $661.41 million, said Glenn Watts, director of budget, planning and analysis.

UW-Madison's share of state funding as a percent of appropriations for the entire University of Wisconsin system decreased from 9.2 percent in 1972-1973 to 5 percent in 1984-1985. In addition, he said, UW-Madison's budget between 1972-1973 and 1981-1982 increased at only 82 percent of the national rate for public institutions.

The state legislature recently authorized a catch-up pay increase of an average of 15 percent to be phased in over two years. The first installment of the catch-up will not be given to the faculty until Jan. 1, 1986, but the figures released by the university's budget office include the catch-up.

Under the plan approved by the state legislature, average pay for a full professor is estimated to increase from about $39,000 to about $52,000 in 1987. Average pay for assistant professors will go from $25,800 to $30,700.

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-- Patrick Dorn (608) 262-2650

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Add 2--faculty salaries

The 25 top-paid faculty members at University of Wisconsin-Madison, with the "catch-up" percentage that they will receive Jan. 1, their merit percent increase, and their resulting 1985-86 salary as of Jan. 1, 1986, are:

TOP 25 FACULTY SALARIES -- UW-MADISON, 1985-86

Name, Title	1/1/86 catch-up	merit	salary
Hector F. DeLuca, biochemistry	7.14%	6.31%	$97,500
Verner E. Suomi, meteorology, space science	3.47%	6%	$89,500
Henry A. Lardy, biochemistry	3.28%	5.43%	$88,747
Paul P. Carbone, human oncology	4.28%	8.30%	$83,360
Willard F. Mueller, ag. economics, law	0%	4.55%	$83,140
R. Byron Bird, chemical engineering	3.75%	2.31%	$83,000*
James F. Crow, genetics	3.40%	3.32%	$83,000
Donald R. Harkness, medicine	4.38%	6%	$81,820
Enid F. Gilbert, pathology, pediatrics	5.09%	7%	$80,910
Henry C. Pitot, oncology	4.23%	5.8%	$80,425
Arthur S. Goldberger, economics	3.97%	4.66%	$80,310*
Howard M. Temin, oncology	4.71%	6.90%	$80,140*
Duard L. Walker, medical microbiology	3.73%	5.5%	$80,135
George E.P. Box, industrial engr., math	4.43%	6.5%	$80,000*
Barry M. Trost, chemistry	7.73%	5.6%	$79,632*
William E. Segar, pediatrics	4.39%	5.9%	$78,530
Carl R. DeBoor, computer science, math	11.43%	7.03%	$78,000
Robert E. Baldwin, economics	4.91%	5.82%	$77,717*
Arthur Kelman, bacteriology, plant pathology	1.89%	5.9%	$76,721
Kelly H. Clifton, human oncology, radiology	5.39%	7.21%	$76,230
Edwin M. Foster, bacteriology	3.11%	5.36%	$76,200
Harry J. Karavolas, physiological chemistry	4.23%	5.9%	$76,160
Robert P. Hanson, bacteriology	0%	3.99%	$75,910
Richard Hong, medical microbiology, pediatrics	4.41%	5.9%	$75,727
Gerald C. Mueller, oncology	4.06%	6.4%	$75,715

*Nine-month appointment

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4/8/85

LIFESAVING STATION TO OPEN

The University Lifesaving Station rescue service on Lake Mendota will open Wednesday (April 10) for the 1985 season.

During the spring season, the station will be open Wednesdays through Sundays. Hours will be 11 a.m.-7 p.m. April 10-27, and 12:30-8:30 p.m. April 28-May 26.

During the summer season, the station will be open daily, 11 a.m.-9 p.m. May 29-July 31 and 10:30 a.m.-8:30 p.m. Aug. 1-Sept. 2.

In the fall, it will be open again only Wednesdays through Sundays, with the following hours: 11:30 a.m.-7:30 p.m., Sept. 4-22; 11 a.m.-7 p.m., Sept. 25-Oct. 6; and 10:30 a.m.-6:30 p.m., Oct. 9-Oct. 27.

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NOAA HONORS SUOMI

UW-Madison meteorologist Verner E. Suomi, a pioneer of the U.S. satellite program, has been honored by the National Oceanic and Atmospheric Administration (NOAA) for his work toward the development of weather satellites.

Suomi, who also heads the UW-Madison Space Science and Engineering Center, was awarded a silver medallion by Department of Commerce Secretary Malcolm Baldrige for outstanding contributions to the development of the the civil U.S. satellite system.

Suomi is known for the development of the cameras used on geostationary satellites and the invention of computer programs by which weather data are transformed into movies depicting the world's weather.

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The College of Engineering
University of Wisconsin-Madison

Engineering Publications Office
433 Wendt Library
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News Release 7/30/86R

Contact: John G. Bollinger 608-262-3481

MADISON--The National Aeronautics and Space Administration announced today that the University of Wisconsin-Madison College of Engineering has been awarded $5 million over the next five years to develop and operate a center in space automation and robotics.

The award was one of four in the nation announced by NASA for activities related to the commercial development of space.

Engineering Dean John G. Bollinger, who will direct the new center, said "This is one of the largest grants our college has ever received. We now have an opportunity to move to the forefront of space technology."

The center will develop technology for a "space service" robot, a food-producing greenhouse in orbit, and a system to mine the moon for a rare form of helium that could produce a vast supply of electric power on earth.

Bollinger said NASA received 25 proposals of this type. "Ours was successful because it draws on long-standing expertise our faculty has in robotics, automation, computing, fusion technology, and agriculture, and because it has outstanding support from industry and the State of Wisconsin."

Verner E. Suomi, director of the UW-Madison Space Science and Engineering Center, will be associate director and chief scientist of the new program.

Joining in the work will be a group of 11 companies, most in Wisconsin. The companies have pledged more than $410,000 in equipment and funding for the first year to help match the federal money, and this company support could grow substantially over the period of work.

Astronautics Corporation of America, with facilities in Milwaukee and Madison, has pledged "at least" $1,000,000 over the 5-year period, and has played a leading role in assembling the technology and the individual support.

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Governor Anthony Earl has said he will seek $250,000 per year in state funding for the center through the Wisconsin Technology Development Fund.

The program will also involve the UW-Milwaukee, Marquette University, and the Milwaukee School of Engineering.

The space automation and robotics center will focus on three areas:

--Development of a robot with human-like arms and dexterous hands to assist or substitute for humans in certain space activities. This space service robot would carry out simple tasks in assembling, maintaining, and repairing satellites and space stations without the expense or danger of using astronauts, Bollinger said.

--Studies of an automated "greenhouse" to supply food for humans in earth orbit. The center will develop low-cost methods of carrying out research to see if such a greenhouse is feasible.

--Studies of the feasibility of mining a rare form of helium on the moon and returning it to earth. UW-Madison engineers have proposed, through articles in the scientific literature, that this helium could provide power for clean and safe nuclear fusion plants producing a vast supply of electricity on earth.

They calculate that one space shuttle load of the moon material could provide as much electricity as the entire nation used last year. A NASA official has said the idea is the only economically feasible reason found so far to go back to the moon.

Because the center's research will cover such a wide range of science and technology, several UW-Madison units in addition to engineering will participate. They include the College of Letters and Science, College of Agricultural and Life Sciences, and the School of Medicine.

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Bollinger said the college has been making plans for building additional space on campus to house activities for new centers like this one. "I hope that the engineering requests for new space are seriously considered," he said. "During the last three weeks we've learned of well over $10 million in new funding for research and education. We have to find places to put these programs."

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2/27/85

SUOMI AWARDED SOVIET MEDAL

Verner E. Suomi, professor of meteorology and director of UW-Madison's Space Science and Engineering Center, has been cited by the Soviet Geophysical Committee of the Soviet Union for his contributions to international geophysical programs.

Suomi is one of nearly 100 American scientists awarded a medal commemorating 100 years of international geophysics, a branch of science that deals with the physics of the earth and includes weather, winds, tides and earthquakes.

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WISCONSIN POVERTY IS TOPIC

Sheldon Danziger, director of UW-Madison's Institute for Research on Poverty, and Ann Nichols-Casebolt, Poverty Institute project associate, will present a colloquium on "Poverty and Income Transfer Policy in Wisconsin" Wednesday (March 6) at 12:15 p.m. in Room 7324 of the Social Science Building.

Danziger and Nichols are affiliated with the Robert M. La Follette Institute of Public Affairs, a public policy research center at the university. The institute is sponsoring the colloquia as part of the Wisconsin Policies and Priorities Project.

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TALK TO DISCUSS DEMISE OF INTERNATIONAL HUMAN RIGHTS

Bryant Garth, an Indiana University law professor, will speak noon Thursday (March 7) on "The Demise of International Human Rights" at a UW-Madison Legal Studies colloquium in Memorial Union.

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Release: Immediately 5/10/84jm

UW-MADISON NEWSBRIEFS

GRANTSMANSHIP WORKSHOP AT MEMORIAL LIBRARY

A grantsmanship workshop for organizations seeking information on funding sources and developing grant proposals will be held May 25 (Friday) at Memorial Library on the University of Wisconsin-Madison campus.

Pre-registration is required for the workshop, which is free and open to the public. Reservations can be made by calling the Memorial Library Reference Desk at (608) 262-3242.

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SUOMI APPOINTED TO SPACE STATION ADVISORY COMMITTEE

Verner E. Suomi, professor of meteorology and director of the University of Wisconsin-Madison's Space Science & Engineering Center, has been appointed to a NASA advisory committee on scientific uses for the manned space station proposed last January by President Ronald Reagan.

As one of 22 members on the committee, Suomi will help NASA plan the proposed space station, identifying scientific experiments that can be done on it, and updating scientific requirements for space station hardware and operations.

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NEW EQUIPMENT DONATED TO ENGINEERING SCHOOL

Two mass flow meters to be used in engineering laboratories have been donated to the University of Wisconsin-Madison by Micro Motion Inc. of Boulder, Colo.

Valued at $6,700, the meters will be used in the university's chemical and mechanical engineering departments to measure the flow of fluids in various experiments.

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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 12/16/83

CONTACT: Verner E. Suomi (608) 262-6172

UW-MADISON'S SUOMI TO RECEIVE FRANKLIN MEDAL

MADISON--Verner E. Suomi, a University of Wisconsin-Madison meteorology professor, was named this week as the winner of the 1983 Franklin Medal, one of the oldest and most prestigious awards recognizing accomplishments in the physical sciences.

As the 103rd recipient of the honor given by the Franklin Institute, Suomi, who also is the founder and director of the UW-Madison Space Science and Engineering Center, joins an elite group of scientists. Previous medal winners include Albert Einstein, Thomas Edison, Orville Wright, Max Planck and Enrico Fermi.

The Franklin Medal is awarded to scientists who, in the view of the institute's Committee on Science and Arts, "have done the most to advance a knowledge of physical science or its applications."

Suomi will receive the medal Jan. 17 during ceremonies held at the Franklin Institute in Philadelphia. The event marks the 277th anniversary of the birth of Benjamin Franklin, the institute's namesake.

A UW-Madison faculty member for 35 years, Suomi is recognized as the father of weather satellite research. He invented the spin-scan camera for nearly continuous monitoring of the earth's atmosphere. According to the committee that nominated Suomi for the award, the camera, which now is standard equipment on weather satellites, "revolutionized satellite meteorology" and has "saved millions of dollars in weather observations."

-more-

Add 1--Suomi

Suomi, 68, also directed the UW-Madison research effort that led to the Man-computer Interactive Data Access System, a computerized system for analyzing weather data in previously unattainable detail. The system has been installed in weather research centers throughout the world and has been used to provide weather information for U.S. Space Shuttle flights.

A Minnesota native, Suomi is one of a handful of scientists responsible for an international weather research program. After 14 years of crusading for such a program, their efforts materialized in the Global Atmospheric Research Program that began in 1973. The six-year project involved scores of nations.

The 150-year-old Franklin Institute is a not-for-profit center that supports scientific research and promotes science education.

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THE FRANKLIN INSTITUTE

FOR RELEASE:

V. Suomi

Upon Receipt

BENJAMIN FRANKLIN PARKWAY AT 20TH STREET, PHILADELPHIA, PENNSYLVANIA 19103 (215) 448-1000

CONTACT:

ZeeAnn MacDonald Mason (215) 448-1452
Michael J. Clark (215) 845-2576

PRESTIGIOUS FRANKLIN MEDAL WON BY UNIVERSITY OF WISCONSIN SCIENTIST

1983

Philadelphia, Nov. 30--Professor Verner E. Suomi was born on December 6, 1915 in Eveleth, Minnesota. He received his B.S. degree in 1939 from Winona State College, Winona, Minnesota. He received his Ph.D. from the University of Chicago in 1953.

Professor Suomi joined the faculty of the University of Wisconsin in 1948. He was appointed jointly to the College of Letters and Sciences (Meterology), and Agriculture (Soils), and the Institute for Environmental Studies. He served as Chairman of the Department of Meterology from 1950 to 1952 from 1954 to 1957, and is currently Professor of Meterology and Director of the multidisciplinary Space Science and Engineering Center which he organized in 1966.

In 1962 Professor Suomi served temporarily as Associate Program Director for Atmospheric Sciences in the National Science Foundation and accepted a second appointment as Chief Scientist of the United States Weather Bureau in 1964.

-More-

ADD 1
Franklin Medal

His most noted contribution to meterology is the "spin-scan" camera which has revolutionized satellite meterology upon which the world's largest international scientific undertaking is based and which has saved millions of dollars in weather observations.

The "spin-scan" camera has made it possible to observe the same weather system at intervals of a few minutes. From these observations, it is possible to measure the dynamics of various phenomena such as air motion, cloud height and growth rates, rainfall location and amounts, and the extent of atmospheric pollution.

Dr. Suomi lives in Madison, Wisconsin with his wife, Paula Meyer Suomi. The couple have three children.

The citation for the Franklin Medal reads: "In consideration of his pioneering vision, research and leadership in the development of Satellite Meterology and for the development of the "spin-scan" camera which revoluntionized weather observations."

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December 1983

(Editor's Note: for additional information on Dr. Suomi and his work, please contact him directly. His number is (608) 262-6172.)

THE FRANKLIN INSTITUTE

FOR RELEASE:

V. Suomi

Upon Receipt

BENJAMIN FRANKLIN PARKWAY AT 20TH STREET, PHILADELPHIA, PENNSYLVANIA 19103 (215) 448-1000

CONTACT:

ZeeAnn MacDonald Mason (215) 448-1452
Michael J. Clark (215) 845-2576

THE FRANKLIN INSTITUTE ANNOUNCES AWARD WINNERS

Philadelphia, Nov. 30 1983 --A scientist who helped revolutionize the way weather forecasts are seen on television will be one of 11 researchers honored for their contributions by The Franklin Institute, officials from The Franklin Institute have announced.

One of the Institute's highest and most prestigious awards, the Franklin Medal, will go to Dr. Verner E. Suomi, professor of meteorology and director of the Space Studies and Engineering Center at the University of Wisconsin.

Dr. Suomi helped develop the special cameras on satellites used to display pictures and movies of clouds and storms seen on television every day. Most recently, the cameras have been improved to include images of temperature and moisture as well. This has resulted in improvements to weather forecasts and forecasting of storm severity.

The medalists were selected by the Committee on Science and the Arts. Each year, the Committee selects those to be recommended for the awards. The Committee is made up of more than 70 members from the scientific and engineering community.

-more-

ADD 1

Besides Dr. Suomi ten other scientists will be receiving medals.

Dr. Eugene Garfield, founder and president of the Philadelphia-based Institute for Scientific Information, will receive the John Price Wetherill Medal for developing innovative information systems for managing scientific data.

Dr. Adam Lender, head of advanced development of transmission systems for GTE Network Systems, will receive the Stuart Ballantine Medal for his communications research that resulted in a speeding up of information transfer and exchange while at the same time reducing the cost to consumers.

Professor Hyatt Gibbs of the University of Arizona Physics Department will receive the Michelson Medal for his work in optics.

Dr. Robert M. White, President of the National Academy of Engineering will receive the Delmer S. Fahrney Medal for his contributions to the development of an operational weather satellite network for the United States.

Dr. Herbert B. Callen, professor of physics at the University of Pennsylvania and Dr. Elizabeth F. Neufeld, Chief, Genetics and Biochemistry Branch of the National Institute of Arthritis, Diabetes and Digestive and Kidney Diseases will receive the Elliott Cresson Medal. Dr. Callen will be honored for his work in thermodynamics. Dr. Neufeld will receive the honor for her research work on genetic diseases.

Professor S. Stanford Manson, professor of Mechanical and Aerospace Engineering at Case Western Reserve University and Dr. Louis F. Coffin of the Corporate Research & Development department of General Electric, both will receive the Francis J. Clamer Medal for their research into metal fatigue.

-more-

ADD 2

Dr. Paul C. Lauterbur of the Department of Chemistry of the State University of New York at Stony Brook and Dr. George G. Guilbault, a professor of chemistry at the University of New Orleans will each receive the Howard N. Potts Medal.

Dr. Lauterbur will be honored for his work in developing a practical use of nuclear magnetic resonance to determine the composition and location of various substances within the body. Dr. Guilbault will be honored for his contributions in analytical chemistry and biochemistry, and particularly the adaptation of measuring methods to practice in the clinical laboratory.

The awards will be presented at formal ceremonies to be held at the Franklin Institute, 20th and the Parkway starting at 6 p.m. on January 17th.

Editors Note:
(1) Coverage of the event is invited.
(2) Interviews with medalists of Franklin Institute officials can be arranged either before or after the event.
(3) Background information on Medal Day and the individual awards is included.

# # #

December 1983

uw news

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

Release: Immediately 4/15/83 uns

UW-MADISON NEWSBRIEFS

CONTACT: Verner E. Suomi (608) 262-6172

VERNER SUOMI TO RECEIVE HONORARY DEGREE

Verner E. Suomi, UW-Madison meteorology professor, will receive an honorary degree from the State University of New York in recognition of his contributions to weather and planetary research.

Suomi, founder and director of UW-Madison's Space Science and Engineering Center, will receive an honorary doctorate of science during ceremonies May 22 at the State University of New York at Albany. The New York university system has awarded honorary degrees only two other times in its history.

Regarded as the father of weather satellite research, Suomi invented the spin-scan camera, which snaps pictures of the earth's atmosphere every few minutes, and other sensing devices now used on weather satellites of the United States and other countries. He also is one of the original proposers of the Global Atmospheric Research Program, an international weather-research effort conducted in 1973-79.

The author of three books and more than 100 scientific articles, Suomi received the National Medal of Science from President Carter in 1977.

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Summer Sessions Bulletin -- 1982

Verner Suomi – *Space Science and Engineering*

In 1978, three spacecraft modules plunged to the surface of the planet Venus, carrying heat-sensing equipment built by UW-Madison's Space Science and Engineering Center. Originator of the concept was Meteorology Professor Verner Suomi, who also organized the Center in 1966.

For his outstanding accomplishments and contributions to the Pioneer Venus Project, Suomi received NASA's Exceptional Scientific Achievement Medal. Three years earlier, in a White House ceremony, President Carter had presented him the National Medal of Science.

Suomi joined the UW-Madison faculty in 1948, and received his Ph.D. in Meteorology from the University of Chicago in 1953. He served a temporary appointment as Associate Program Director for Atmospheric Sciences in the National Science Foundation in 1962, and as Chief Scientist of the U.S. Weather Bureau in 1964. In 1968, he was elected President of the American Meteorology Society.

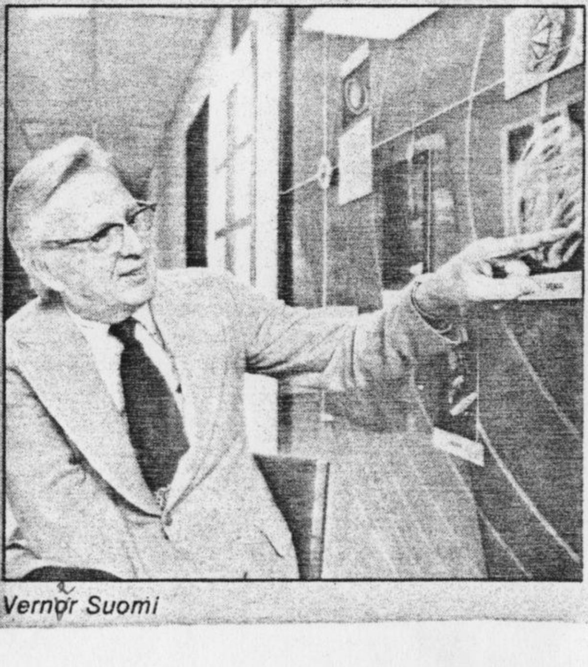
Research programs conducted by Suomi include moisture measurements in the stratosphere, sonic anemometry and thermometry for studies of atmospheric turbulence near the ground, invention of radiant temperature sensing devices and a light weight radio altimeter for balloon programs, and extensive investigations into the energy budgets of the earth's surface.

As director of the UW-Madison team, Suomi was responsible for development of radiation experiments for EXPLORER VII, the TIROS-TOS satellites, and invention of the spin scan camera system now used on our geostationary weather satellites. This has been expanded recently to obtain air temperature soundings as well. He served as a member on the Venus/Mercury 1973 Imaging Science Team, and is also a member of the Mariner/Jupiter Saturn Imaging Science Team, and the Pioneer Venus Science Steering Group.

Antennas that draw as far east as Africa and as far west as Hawaii and beyond, beckon visitors to the Meteorology and Space Science Building at UW-Madison, where the receiving station on the fifteenth floor and a myriad of equipment on the sixth floor provide a fascinating look at the future. The Center has built similar systems for others around the country and the world. One such system is operating in Germany and another is currently being built for the Peoples Republic of China. A system in Milwaukee is used mainly for research; two in Kansas City, MO are used to predict severe weather and another in Huntsville, AL is being used in the space program to help assess weather for bringing space shuttles back.

An important future step for Suomi and the Center occurred on July 14, 1980, with the signing of a Memorandum of Understanding between UW-Madison and the National Oceanographic Atmospheric Association, establishing the Cooperative Institute for Meteorological Satellite Studies. Suomi was appointed Director of the Institute a month later. With two new satellites, launched in 1981, Suomi says we can now obtain the temperature and moisture structure of the atmosphere through remote sensing.

Exploring satellites for better understanding and prediction of weather is both a professional and personal interest for Suomi. An avid camper in northern Wisconsin, he feels now we have much better information to serve campers, but our delivery systems are still lacking. "The radio doesn't provide enough information," he laments. "Temperature isn't what's really important to campers; I want to know about rain — where, when and what kind — and about strong winds."



Vernor Suomi

uw news

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

Release: Immediately 8/25/80 jhs

(NOTE TO EDITORS: This story being released simultaneously by NOAA and UW-Madison.)

SATELLITE WEATHER RESEARCH INSTITUTE CREATED AT UW-MADISON

MADISON--Creation of a research institute using space satellite information to probe the workings of weather has been approved by its joint partners, the National Oceanic and Atmospheric Administration (NOAA) and University of Wisconsin-Madison.

The announcement that NOAA administrator Richard A. Frank had signed an agreement creating CIMSS--the Cooperative Institute for Meteorological Satellite Studies--was made Monday (Aug. 25) in Washington, D.C. UW-Madison Chancellor Irving Shain already had signed the agreement.

CIMSS will support research scientists from NOAA's National Environmental Satellite Service, the University's Space Science and Engineering Center, the meteorology department and, perhaps later, other universities and agencies from inside and outside the United States.

Research already earmarked for CIMSS includes satellite studies of large-scale weather formations and a project called AgRISTARS, a six-year effort which includes global rainfall estimates and predictions of weather conditions affecting major farm crops. Plans also call for some work on the concept of a regional weather forecasting system.

- more -

Including the transfer of present research and new projects, the institute's budget is expected to top $1 million within a year, said University and federal officials. It will be one of only six such cooperative NOAA institutes, according to Earl G. Droessler, head of NOAA's Office of University Affairs; it will be the only institute dealing with satellite information.

For University researchers, CIMSS will provide a chance to work with weather scientists from government and other universities, according to Professor Verner E. Suomi, named Friday as CIMSS' director. In addition, it lends an organizational structure for broader projects and more consistent funding. "You can plan further ahead, and that's important," Suomi said.

Suomi's appointment by the dean of UW-Madison's Graduate School, Robert M. Bock, was announced Friday at an inaugural luncheon and later reception here for CIMSS. Droessler was a special guest at both events.

For NOAA, said Droessler, CIMSS represents a way to find solutions to the technical and scientific problems of using satellite data in weather analysis and prediction. He said it also signifies a growing relationship between NOAA and the academic world.

William L. Smith, who came to Madison in 1977 as head of a National Environmental Satellite Service team stationed on campus, noted that NOAA needs the kind of research done by universities--and especially the kind of results that can be applied quickly. Because institutes traditionally are strong on applied research, Smith added, "the government gets research which is in more direct support of its operational mandates."

The CIMSS agreement calls for the institute to be run by an executive board of University and NOAA officials, and administered by Suomi. An advisory council of government and academic members will suggest the scientific role and standards CIMSS should exercise.

"What (the institute) does is put on a more formal and permanent basis the cooperation that has been going on for a decade or more," said Suomi, who also is director of the University's Space Science and Meteorology Center.

That cooperation, Droessler said, "has been unusually successful." The creation of CIMSS recognizes, he added, "one of the most productive research capacities in the country."

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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 4/22/80 jhs

UW-MADISON FACULTY BRIEFS

SUOMI HONORED BY FEDERAL AGENCIES

Verner E. Suomi, 10 Rosewood Circle, has been presented the William T. Pecora Award sponsored by the National Aeronautics and Space Administration and the U.S. Department of the Interior for his contributions to understanding the earth's atmosphere through remote sensing.

A professor of meteorology and director of UW-Madison's Space Science and Engineering Center, Suomi pioneered in the application of remote sensing to take atmospheric measurements. He and the center also were involved in design and building of atmospheric sensors sent to Venus aboard NASA space probes.

The award was presented at the sixth annual Pecora Symposium and Exposition held in Sioux Falls, S.D. (April 13-17) by the Society of Exploration Geophysicists. The honor is named after a former director of the U.S. Geological Survey and Undersecretary of the Interior.

-o-

Metallurgical engineering Professor Richard A. Moll, 3714 Zwerg Drive, has been reappointed to the Product Safety Advisory Council of the Wisconsin Department of Agriculture, Trade and Consumer Protection.

-o-

Mechanical engineering Professor Ali A. Seireg, 219 DuRose Terrace, has been named to receive the Centennial Award of the Design Engineering Division of the American Society of Mechanical Engineers. He also has been named national chairman of the newly-organized Computer Engineering Division of the ASME.

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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 3/3/80 ns

UW-MADISON NEWSBRIEFS

SUOMI RECEIVES NASA MEDAL

Verner E. Suomi, director of the Space Science and Engineering Center at University of Wisconsin-Madison, has been awarded the Exceptional Scientific Achievement Medal by the National Aeronautics and Space Administration (NASA).

NASA said it was honoring the UW-Madison meteorology professor for his role in the Pioneer spaceshot to Venus. Three spacecraft modules plunged to the plantet's surface in 1978 carrying heat-sensing equipment designed and built by the University's space science center around a concept originated by Suomi.

A member of the UW-Madison faculty since 1948, Suomi lives at 10 Rosewood Circle.

- o -

NARAIN'S VOLUME PUBLISHED IN NEW DELHI

Awadh K. Narain, 6325 Piping Rock Road, was editor of "Studies in History of Buddhism" published in New Delhi. Narain is a professor of history and South Asian studies at UW-Madison.

- o -

PRINCETON PROFESSOR TO LECTURE ON VAN DYCK PAINTINGS

John Rupert Martin, Marquand professor of art and archeology at Princeton University, will present a public lecture entitled "Van Dyck's Religious Paintings" at 2:30 p.m. Sunday (March 9) in Room 140 at the Elvehjem Museum of Art.

- more -

Professor Martin is on campus until March 14 to present the second series of graduate student seminars honoring Emeritus Professor James Watrous. The seminars are funded by gifts from the Kress Foundation and friends and former students of Professor Watrous.

Martin was a faculty member at the University of Iowa for 23 years before moving to Princeton in 1970. He is a former editor-in-chief of Art Bulletin and a winner of the Charles Rufus Morey Book Award.

- o -

FORMATION OF STATES IS TOPIC OF SYMPOSIUM

A symposium on "The Formation of States in History and Theory" will be held April 10-12 at the Elvehjem Museum of Art.

The second Burdick - Vary Symposium is sponsored by the Institute for Research in the Humanities and the School of Law.

Speakers will trace formation of states from early history through the middle ages.

For more information, contact Loretta Freiling (608) 262-3855.

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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 1/30/80 jhs

SUOMI PRESENTED AWARD BY AMERICAN METEOROLOGICAL SOCIETY

MADISON--Professor Verner E. Suomi, 64, director of the Space Science and Engineering Center at University of Wisconsin-Madison, was awarded the Charles Franklin Brooks Award today (Wednesday) in Los Angeles by the American Meteorological Society (AMS).

Named after the principal founder of the society, the award recognizes Suomi's leadership and advice in meteorology, especially as councilor and president of AMS.

Suomi has been a professor of meteorology at UW-Madison since 1948 and has led the Space Science and Engineering Center since he organized it in 1966. He headed the University team which developed experiments aboard Explorer VII and the TIROS-TOSS satellites, invented the spin-scan cameras aboard the ATS-1 and ATS-3 satellites, and directed the design and construction of atmospheric heat-measuring devices on three of the Pioneer Venus probes.

Brooks, who died in 1958, was a geographer, climatologist and meteorologist who directed Harvard University's Blue Hill Meteorological Observatory for 26 years. He also had taught at Clark University, edited the Monthly Weather Review for the U.S. Weather Bureau and became one of the world's experts on cloud forms. He helped found the society and then guided it for more than a quarter century as secretary and editor of its bulletin.

The award was presented at a luncheon held in connection with the society's 60th annual meeting.

Suomi's other awards include the 1976 National Medal of Science, the Mesinger Award for aeorological research achievement, and AMS's highest award, the Carl-Gustof Rossby Research Medal.

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SPACE
SCIENCE AND
ENGINEERING
CENTER

1225 West Dayton Street
Madison, Wisconsin 53706

THE UNIVERSITY OF WISCONSIN

February 25, 1980

C. A. Syvertson
Director
NASA/Ames Research Center
Moffett Field, California 94035

Attention: APT: 241-3

Dear Mr. Syvertson:

Your recent letter informing me that I have been selected to receive NASA's Exceptional Scientific Achievement Medal was a pleasant surprise. I am greatly honored but this achievement could not have been accomplished without the efforts of my co-workers which led to the ultimate success of the Pioneer/Venus Project.

It is with regret that I cannot attend the Pioneer Honor Awards Ceremony on the 28th of February because of a previous commitment. This indeed is a disappointment to me.

Please convey my regrets to Dr. Alan Lovelace, NASA's Deputy Administrator and to all who have worked so hard to make this a very happy occasion. Thank you.

Sincerely,

Verner E. Suomi

Verner E. Suomi
Director

VES/bjj

National Aeronautics and
Space Administration

Ames Research Center
Moffett Field, California 94035

NASA

FEB 19 1980

Reply to Attn of: APT:241-3

February 12, 1980

Dr. Verner E. Suomi
University of Wisconsin-Madison
Space Science and Engineering Center
1225 W. Dayton Street
Madison, WI 53706

Dear Dr. Suomi:

Over the years, Ames Research Center has made some outstanding scientific gains. The scientific accomplishments of Pioneer Venus and Pioneer Saturn missions are examples of the superior technological skills and knowledge of Ames and contractor employees. People such as yourself have made significant contributions which accounted for the success of the project.

For your efforts you have been selected to receive NASA's Exceptional Scientific Achievement Medal. I would like to take this opportunity to personally congratulate you for your outstanding accomplishments and contributions to the Pioneer Venus Project.

Dr. Alan Lovelace, NASA's Deputy Administrator, will be presenting the awards at a Pioneer Honor Awards Ceremony in the Ames Auditorium, Building N-201, at 1 p.m. on Thursday, February 28, 1980. You and your family are cordially invited to attend the ceremony and the reception following. Please inform Ms. Nina Mark at Mail Stop 241-3 or telephone 965-5422 if you will be able to attend.

4:15

With best regards,

C. A. Syvertson

C. A. Syvertson
Director

January 1980

AMERICAN METEOROLOGICAL SOCIETY

45 BEACON STREET, BOSTON, MASSACHUSETTS 02108

AREA CODE 617 227-2425
CABLE: ATMOSPHERE BOSTON

KENNETH C. SPENGLER, EXECUTIVE DIRECTOR

NOV 5 1979

October 30, 1979

CONFIDENTIAL UNTIL JANUARY 30, 1980

Prof. Verner E. Suomi, Director
Space Science and Engineering Center
University of Wisconsin
Madison, Wisconsin 53706

Dear Professor Suomi:

It is a pleasure to inform you that the Council of the American Meteorological Society at its meeting on September 27, 1979, voted to give you the Charles Franklin Brooks Award.

The Society awards will be presented at the Awards Luncheon at the 60th Annual Meeting on Wednesday, January 30, 1980, at noon in the Biltmore Hotel, Los Angeles, California. Please return to us the enclosed statement regarding your attendance at the Awards Luncheon as soon as possible.

A copy of the 60th Annual Meeting Program will be sent to you at a later date.

sent by Vicki 1 Nov 79

An awards brochure containing the names of the award winners, the citations, and a picture of each winner will be distributed at the Awards Luncheon. Please send us as soon as possible your photograph (a glossy black-and-white), the name and address of the organization with which you are affiliated, and your position there as you would like them to appear in the brochure. Enclosed is a page from the 1979 Awards Brochure, showing the format used.

On behalf of the Society I wish to congratulate you on your achievements and to express our pleasure at being able to recognize your work by this award.

Yours truly,

John E. Wallace

John E. Wallace
Secretary of the Council

JEW:jc
enclosures

uw news From The University of Wisconsin-Madison
Bascom Hall, 500 Lincoln Drive, Madison 53706

The University of Michigan news Information Services
6008 Administration Building
Ann Arbor, Michigan 48109

NASA News
National Aeronautics and Space Administration
Ames Research Center
Moffett Field, California 94035

CONTACTS:

Wisconsin: Joe Sayrs (608) 262-8290

Michigan : Joel Berger (313) 764-7260

NASA : Pete Waller (415) 965-5091

For Immediate Release

11/15/78

CHICAGO PRESS CONFERENCE TO HIGHLIGHT PIONEER VENUS PROBE

Scientists and project heads from two Midwest universities and the National Aeronautics and Space Administration will highlight the NASA Pioneer Venus Project in a joint press conference in Chicago Tuesday (Nov. 21).

Featuring representatives of the University of Michigan, University of Wisconsin-Madison and NASA, the conference is scheduled for 10 a.m. Tuesday at the Chicago Press Club in the lower lobby of the Wrigley Building, 410 N. Michigan Ave. It comes just two days after an in-space maneuver NASA calls the most delicate ever tried; it is just 18 days before four instrument packages plunge through the Venusian atmosphere for a global look at the planet's climate.

Scientists hope to learn enough about the composition and workings of the Venusian atmosphere in one space mission to help explain why the planet is so hot. They suspect that clouds and a dense carbon dioxide atmosphere create a "greenhouse effect," an effect that could be important to an Earth where the air's carbon dioxide content is increasing because of fossil fuels.

In addition, Venus appears to be a very simple weather machine--an ideal laboratory to test theories on what makes climate work. While scientists are cautious, they hold out hope that being able to explain Venusian weather may bring us closer to explaining our own.

The mission involves an Orbiter spacecraft and a separate "bus" launched in August and loaded with four atmospheric probes. Plans call for three of the four probes to be spun off in a split-second maneuver Sunday (Nov. 19). All four will reach Venus Dec. 9 in a pattern spread from the poles to the equator and on both the day and night sides of the planet.

- more -

Slated to be at the conference are:

--Charles F. Hall, NASA's manager of the Pioneer Project at Ames Research Center, Calif. Hall is overall head of the Pioneer-Jupiter Flyby Project, Pioneer Venus Project and the Pioneer 6, 7, 8 and 9 spacecraft now orbiting the sun. He joined Ames in 1942 and has won two NASA service medals.

--Verner M. Suomi, director of the Space Science and Meteorology Center at University of Wisconsin-Madison, who led a four-year effort to design and build the heat-sensing devices aboard three of the probes. A 1976 winner of the National Medal of Science, he is interested in global climate research and has been a leader in applying space science to weather research.

--Thomas M. Donahue, head of the department of atmospheric and oceanic science at University of Michigan, who is chairman of the mission's Science Steering Group for all 30 experiments. Involved in the project since 1970, he is interested in the evolution of the Venusian atmosphere, and why a planet so nearly a twin of Earth should have developed so differently.

Venus, the ancient Morning and Evening Stars, has a hellish climate. Sulfuric acid clouds blot out the sun, diffusing light over a dry, volcanic surface. The temperature is close to 900 degrees (F), hot enough to melt zinc and make some rocks glow red. Its atmosphere is 100 times heavier than Earth's, with a crushing surface pressure to match.

From what scientists know so far, a Venusian weather forecaster would have a boring job--but couldn't make many mistakes. Day or night, the temperature doesn't change. The wind is always one or two miles an hour. It is always cloudy, but there is no rain as we know it. The difference between summer and winter is nearly nonexistent and there is only an 18 degree (F) difference between the equator and the poles. Even the sunrise-sunset times would be dull: they are more than 58 Earth days apart.

It is this very lack of variety, however, that attracts climatologists.

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University News Service

19 Bascom Hall
500 Lincoln Drive
Madison, Wisconsin 53706

UNIVERSITY OF WISCONSIN MADISON

5/23/78

WILL THE 'GREENHOUSE EFFECT' TURN EARTH INTO ANOTHER VENUS?
UW-Developed Equipment Is Aboard Latest Space Probe

EDITORS:

Some scientists fear that the increasing amount of carbon dioxide being added to the Earth's atmosphere may some day make our planet as inhospitable as Venus. It is generally assumed the carbon dioxide atmosphere of Venus acts as a "greenhouse," allowing solar radiation to reach the surface but keeping it from being radiated back into space. Experts believe the thick Venusian clouds rain sulphuric acid on a planet with a surface hot enough to melt lead, tin and zinc.

A major goal of the nation's new Pioneer Venus probe will be to learn why Venus and the Earth, though similar in size, density, and proximity to the sun, have such different environments.

The important role of the University of Wisconsin-Madison in the NASA-sponsored project will be discussed in a news conference to be held this Friday (May 26) at 11 a.m. in Union South, 227 N. Randall Ave. The exact room location will be posted at the entrance to the building on Friday.

National Science Award winner Verner Suomi, director of the Space Science and Engineering Center, will discuss the mission, using scale models of Pioneer Venus I and II, the two spacecraft being used in exploration. Research scientist Evan Richards will also participate.

Equipment on board the spacecraft, the first of which was launched May 20, will probe the planet's gas blanket and gaze into its clouds beginning next December.

Besides helping solve the puzzling questions about Venus, the investigation could provide clues to the future evolution of our own atmosphere and tell more about the basic workings of a planet-scale weather machine.

The University of Wisconsin research team developed a device designed to collect information about the temperature, wind, and clouds of Venus. The "net flux radiometer" will be used to map the planetary positions of sources and absorbers of heat and sunlight and their vertical distribution. The distribution of such energy powers the planet's weather machine, just as it does on Earth.

The device, which weighs a little less than two and one-half pounds, will start operating about 45 miles above the planet and continue until the spacecraft crashes.

The Wisconsin-developed equipment will be aboard Pioneer Venus II, which will be launched Aug. 7. Pioneer Venus II will reach its destination in early December, when it will separate into five spacecraft for descent into the Venusian atmosphere. The Pioneer Venus I craft will reach Venus about the same time, but will go into an orbit around the planet for a Venusian year.

--Richard Mahler (608) 262-0065

Parking for the news conference will be available in Parking Lot 14, approximately one block west of Union South, next to the Engineering Research building. Your vehicle should display your news media "B" parking permit.

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Release: Immediately 4/12/78 rm

UW-MADISON NEWS BRIEFS

OCONOMOWOC LIBRARIAN APPOINTED TO SCHOOL STAFF

Sally A. Davis has been appointed the new Library School librarian, effective June 5.

Davis is currently director of school libraries at Oconomowoc. A native of Chicago, she holds degrees from the UW-Madison's Library School and School of Education.

- o -

Meteorology Prof. Verner E. Suomi, director of the Space Science and Engineering Center, has been elected a Councilor of the American Meteorological Society. Suomi will serve a three-year term.

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MML - File

SSEC
SPACE CAPSULE

APRIL 1978

PROFESSOR SUOMI AWARDED NATIONAL MEDAL OF SCIENCE

Professor Verner E. Suomi, Director of the Space Science and Engineering Center, was awarded the National Medal of Science for 1976. At ceremonies in Washington, D.C. on November 22, 1977, he and 14 other distinguished scientists and researchers received the gold medal and personal congratulations from President Jimmy Carter.

The presidential citation praised Professor Suomi as " ... a distinguished meteorologist (who) has provided a new view of the dynamics of our atmosphere which already has brought substantial benefits to the people of this Nation and the world. Dr. Suomi has been a major driving force in the application of space systems for improved weather service to the public."

Professor Suomi's nomination was based on his technological contributions to meteorology (including the spin-scan satellite camera, the flat-plate radiometer, the pulsed radar balloon radio-altimeter for weather balloons, and the McIDAS computerized video display system), as well as his role in the conception and direction of GARP (the Global Atmospheric Research Program), and his excellence as a professor of meteorology at UW-Madison.

Congress established the National Science Medal Awards in 1959 to honor outstanding researchers in the physical, biological, mathematical, and engineering sciences. The first award (the only one given in 1962) was given by President John F. Kennedy to Theodore Von Karman, an aeronautical engineering expert at California Institute of Technology. Since then some 130 eminent scientists have received the medal.

Nominations are solicited each year from the top 150 American universities, several hundred scientific organizations, and from the divisions of the National Academy of Science and the National Academy of Engineering. A special twelve-member presidential panel prepares a list of possible winners for the president to consider. At his discretion, as many as 20 awards can be presented in one year.

The medal, itself, is a golden disc about three inches in diameter. On its face is the profile of a man contemplating the land, sea, and sky around him. A crystal in his hand symbolizes the basic order of the universe, and a mathematical formula traced in the sand beside him represents man's efforts at scientific abstraction.

A native of Minnesota, Professor Suomi joined the UW-Madison faculty in 1948, appointed jointly by the College of Letters and Sciences (Meteorology) and the College of Agriculture (Soils). Chairman of the Department of Meteorology from 1950-1952 and from 1954-1957, he is currently a Professor of Meteorology, as well as Director of the Space Science and Engineering Center which he organized in 1966.

Professor Suomi has received several other awards for his contributions to weather research, including the Meisinger Award for aerological research achievement and the Carl-Gustaf Rossby Research Medal (the highest award given by the American Meteorological Society). He also received a Letter of Commendation from President Nixon (1970) and the Robert M. Losey Award (1971) from the American Institute of Aeronautics and Astronautics.

A member of the National Academy of Engineering and of several other professional and honorary societies, Professor Suomi has published more than 70 articles, books, and book contributions on meteorology and associated technology.

SECOND ANTENNA SYSTEM FUNCTIONING

The second antenna system is now operational. Mechanically installed last July, procurement of the amplifiers postponed its functioning until now. The new solid state amplifier system has been getting "good pictures" since January 24, according to Leo Skille. The positioning control circuitry, installed with digital read-outs, can indicate antenna position in reference to satellites within a tenth of a degree.

The amplifiers and down converters are cooled by thermal electric coolers and heat pipes to dissipate internal heat. There are provisions to monitor internal temperatures within the amplifiers. The feed assembly, which is the housing unit for the antenna and amplifiers, is pressurized with dry nitrogen.

"I would like to give credit to Bob Sutton (the instrument maker)," said Skille, "and Professor Stremler, Steve Rusboldt, and Mark Scheuer, all of whom deserve credit for their work on the project."

Professor Stremler pointed out that reliability, gained through the solid state system, is the biggest advantage.

SPACE TELESCOPE HIGH SPEED PHOTOMETER CONTRACT AWARDED

A contract for Phase 1 instrument definition of the Space Telescope High Speed Photometer has been awarded by NASA, Goddard Space Flight Center, to the University of Wisconsin. Professor Robert C. Bless of the Astronomy Department was selected to lead a team of co-investigators who will determine the scientific requirements of the instrument. The other co-investigators include Dr. Arthur Code of the UW Astronomy Department, Drs. Wayne Van Citters and Edward Robinson of the University of Texas at Austin, and Dr. James Elliott of Cornell University.

The High Speed Photometer is one of five instruments selected for the initial payload of the Space Telescope. The Telescope is a 2.4 meter diameter f/24 Cassegrain reflector which will be launched by the Space Shuttle in late 1983. The overall size of the Space Telescope is 43 feet long by 14 feet in diameter. (This is roughly the size of the 100 inch telescope at Mount Wilson.) It is planned to operate the Space Telescope in orbit for at least 20 years, with periodic visits by Shuttle astronauts for routine maintenance, and return to earth for major refurbishment.

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Release: Immediately 7/21/77 mh

FOUR ELECTED TO ACADEMY OF ARTS AND SCIENCES

MADISON--Four outstanding University of Wisconsin-Madison professors were elected to the American Academy of Arts and Sciences at its recent 197th meeting in Boston.

W. Wallace Cleland, professor of biochemistry for nearly 20 years, is widely known for his research in enzyme reactions. Arthur Kelman, L. R. Jones Distinguished Professor of Plant Pathology, is president of the International Society of Plant Pathology.

Prof. Arthur S. Goldberger teaches econometrics and is senior researcher at the UW-Madison Institute for Research on Poverty. Verner E. Suomi, Harry Wexler Professor of Meteorology, is UW-Madison Space Science and Engineering Center director and vice chairman of the National Academy of Sciences Committee on Atmospheric Sciences.

The Academy was founded in 1780 by John Adams to select people "of genius and learning" to cultivate and diffuse the arts and sciences. It is the second oldest learned society in the United States.

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Release: Immediately 11/17/76 jfh

PROBE OF WEATHER ON VENUS IS NEXT FOR BADGER SPACE SCIENCE TEAM

MADISON--While the world watches the two Viking spacecraft on Mars, researchers at University of Wisconsin-Madison are already looking ahead toward exploration of Venus, our nearest planetary neighbor.

The NASA Pioneer Venus mission, scheduled for launch in about a year, will evaluate nature and composition of the Venusian atmosphere. Instruments designed and built at UW-Madison's Space Science and Engineering Center (SSEC) will play a major role.

Sometime in 1978, the Pioneer spacecraft will approach Venus and release three small instrument probes and one large probe. All four will be sent to predetermined locations above the planet -- two on the dark or "night" side and two on the "day" side -- before plunging into the atmosphere to take their measurements.

The three small probes will be packed with instruments, including a "net flux radiometer" developed by UW/SSEC scientists. The radiometer measures the difference between solar energy reaching the planet and energy radiated from the planet itself. This indicates the amount of energy absorbed by the atmosphere, and gives researchers an important clue to "weather" on Venus.

The Venus study may help explain earth's weather patterns as well. Since Venus has no tides or season changes, it provides an ideal model for study of atmospheric circulation.

- more -

Add one--Venus probe

When the probes encounter the top of the Venusian atmosphere, they'll be moving at about 25,000 miles per hour. But within 45 seconds they'll slow down to 1150 mph (about 43 miles above the planet's surface) at which point the radiometers will shed their protective covers and begin taking measurements.

The probes will then free-fall through the dense atmosphere for almost an hour, slowing down still further and finally crashing into the surface of Venus at a mere 15 mph.

In the last few minutes of their descent, however, the probes will have to withstand atmospheric temperatures of 500°C (932°F) and pressure of about 1500 pounds per square inch (about 100 times the atmospheric pressure on earth).

UW participation began in 1972, when a proposal for development of the radiometer instruments was prepared by Prof. Verner E. Suomi and Dr. Lawrence A. Sromovsky of SSEC. The National Aeronautics and Space Administration selected the SSEC proposal, and design work began at UW in October 1973. Prof. Suomi, director of SSEC and a pioneer in satellite weather studies, is principal investigator on the radiometer project, and Prof. Sromovsky is co-investigator.

Selection of the UW proposal to build as well as design the radiometers is quite unusual. "Most university scientists conceptualize the instruments they need to obtain certain data, and then NASA contracts with an outside company to do the construction," says Robert Dombroski, project manager on the SSEC Pioneer Venus team.

"In the case of SSEC, however, we can build it right here where the scientists are always available for consultation. Few universities have the technical personnel and equipment to carry out such complex work," he says.

SSEC is fabricating and testing the first of five radiometers it has contracted to deliver. Prototype units are being tested by Hughes Aircraft Corp., prime contractor for the Pioneer spacecraft. SSEC will deliver the actual Pioneer flight radiometers by April 1977.

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Release: Immediately

11/4/75 gf

ADVANCES IN WEATHER FORECASTING TO BE SUOMI TOPIC

MADISON--Advances in meteorology will be the topic of a public lecture Thursday (Nov. 6) at 8:15 p.m. in room 1240 of the University of Wisconsin-Madison Computer Science Building.

The director of the UW Space Science and Engineering Center, meteorology Prof. Verner E. Suomi, will be the guest speaker. He will focus on weather forecasting techniques and how they have been influenced by studies of the planet Venus.

Suomi is the vice chairman of the U.S. Committee for the Global Atmospheric Research Program (GARP), and is the U.S. representative to the GARP Joint Organizing Committee. GARP is an international project aimed at making accurate five-day weather forecasts a reality. It will use information from satellites, weather balloons, aircraft, ground stations, ships and ocean buoys.

Suomi first proposed use of satellites to measure winds in the mid-1960s. His invention, the spin scan camera which provides the basis for accurate measurements of cloud movements, made use of satellites in the project possible.

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Release: Immediately

10/29/75 gf

SCIENTISTS SCORE ADVANCE TOWARD MORE ACCURATE FORECASTS

MADISON--A significant step toward accurate five-day weather forecasts has been completed by scientists at the University of Wisconsin-Madison.

An extended test recently proved efficiency and reliability of McIDAS (Man-Computer Interactive Data Access System), a network of computers and human operators essential to making long range weather forecasts.

McIDAS compiles and analyzes satellite information about the movement of clouds. From this information, it is possible to measure velocity and direction of winds.

Project researcher Fred Mosher says the test was successful but not flawless.

"We've developed a system that can do the job," he said. "We'll retest it in January to get out the few remaining problems."

The test successfully completed a seven-year program begun by Prof. Verner Suomi, director of the UW-Madison Space Science and Engineering Center. His goal was to accurately measure winds at a low cost. Prof. Thomas Haig, executive director of the center, says that each wind measurement using McIDAS costs only 28 cents as compared to $15 or more per measurement for a conventional method such as balloons.

McIDAS will be used in an international effort known as the Global Atmospheric Research Program (GARP), scheduled to begin operation in the late 1970s. The program is sponsored by the United Nations.

- more -

Add one--forecasting

GARP will use information from satellites, weather balloons, aircraft, ground stations, ships and ocean buoys to feed into a computer model of the earth's weather. From this information, the model should be able to predict weather at least five days in advance.

Mosher describes the program as "weather's equivalent of going to the moon" because of the great expenditure of time and effort. It requires five specially designed weather satellites, a data system capable of coordinating satellite information, and world reports from sources already available such as balloons and ground stations.

The program began in the early 1960s when Pres. John Kennedy asked for international cooperation in weather forecasting.

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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.

- more -

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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Release: Immediately 1/17/74 meb

(PICTURE AVAILABLE)

NEW ANTENNA WILL BRING BETTER PICTURES FROM WEATHER SATELLITE

MADISON--An antenna 24 feet in diameter is being assembled on the roof of the Meteorological and Space Science Building at the University of Wisconsin-Madison. It is one of only three antennas capable of receiving retransmitted pictures of the earth from a new weather satellite to be launched next March.

The pictures, retransmitted in the same way communications satellites send TV signals, will be brighter and sharper than pictures previously redistributed over telephone lines.

Two meteorological satellites are now in orbit. One of them stopped transmitting last fall after sending pictures at half hour intervals for seven years.

Thomas O. Haig, associate director of space science, said the new satellite would orbit 22,000 miles high over a fixed point on earth. It will have the same "spin scan" camera earlier weather satellites used. That camera, developed by Prof. Verner E. Soumi, director of space science at the UW-Madison, with the cooperation of the Santa Barbara Research Institute, is really a telescope, Haig said.

As the satellite spins at a rate of 100 rotations each minute, a mirror that reflects the image of the earth below changes position slightly. On each spin, the picture of a thin strip of the earth is sent to a central receiving station with a 60-foot antenna on Wallops Island, Va. After 2,400 rotations, or about one-half hour, those strips form a complete picture of the earth and its cloud cover.

Then the process begins again. In another half hour, the next picture begins to show which way the clouds are moving.

- more -

Add one--antenna

Transmission of each section of the photograph takes only a small fraction of the time required for each rotation. The new satellite's transmitter will readjust itself during the rest of the rotation period and retransmit the image, in a modified form, to smaller antennas like the one being constructed here.

When the signal is received, it will be fed into a computer system UW-Madison meteorologists call McIDA--Man Computer Interactive Data Access System. Using complex mathematical juxtapositions, they can accurately plot the direction and speed of winds and estimate rainfall. This information is especially valuable in determining weather at sea where there are no stations to take measurements.

The antenna was purchased from the National Oceanic and Atmospheric Administration with a grant from the National Science Foundation. Assembly of the antenna will be completed soon--if the weather is good.

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Release: Immediately 7/13/73

UIR SCIENCE WRITING DIVISION
University-Industry Research Program (608-263-2876)

By BOB EBISCH
UW Science Writer

MADISON, Wis.--University of Wisconsin-Madison space scientist Verner Suomi and Feodor Ostapoff of Miami's Sea-Air Interaction Laboratory will spend the first 10 days of August working on a Russian research ship.

The Wisconsin scientists will be traded temporarily for two Russian scientists as part of the preparations for next year's Atlantic Tropical Experiment (GATE).

The study is part of the Global Atmospheric Research Program (GARP), an international project aimed at increasing understanding of the atmosphere and laying the bases for long range weather prediction by monitoring weather on a global scale.

First conceived more than a decade ago, GARP has grown to vast proportions. Although exact figures on its size are unavailable, one of its co-sponsors, the World Meteorological Organization, lists 132 member countries, according to Doug Sargeant, deputy director of the U.S. GATE Project Office in Washington.

"GARP itself has many other programs besides GATE," Sargeant says, "and it will be in action through at least the end of this decade. But the GATE field work will climax next summer, involving ships, planes, and satellites from about 15 countries."

- more -

The purpose of this summer's testing program is to compare American and Russian equipment that will measure the earth's boundary layer--that part of the atmosphere near the ground.

The boundary layer is important as the area where heat energy is passed from the earth to the atmosphere.

"Most of the sun's energy hits the earth in the tropics, where GATE is scheduled," explains Wisconsin space scientist Tom Haig, "and is transferred from the water through the boundary layer and into the atmosphere by heat convection. How it occurs is poorly understood and finding out is GATE's principal concern."

Part of the boundary layer measurements will be made using BLIS, the Boundary Layer Instrumentation System developed at Wisconsin's space science and engineering center.

Pretested last January and February near Miami, the system consists of five instrumentation packages deployed along a line running from a ship to a balloon suspended 1500 meters above. Each package will measure wind direction and speed, temperature, humidity, and pressure. It will have several internal devices to organize data and sensors to keep tabs on the unit's operation.

A Mexican research vessel, the U.S. ship "The Researcher," and Russia's "The Academician Korolov" will probably be alone at their meeting in the Atlantic west of Senegal.

The emphasis is on Russian-American intercomparison because ships contributed by these countries are most numerous and because they represent the extremes in instrumentation differences.

"Since we each have our own systems of data collection there will be problems with equipment and there will be problems in bringing all our data to a common standard," Sargeant says, "so it's only natural that we get together in advance of GATE, each to learn how the other does things."

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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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Release: Immediately 6/8/73

UIR SCIENCE WRITING DIVISION
University-Industry Research Program (608) 263-2876

By ROBERT EBISCH
UW Science Writer

MADISON, WI.--A fleet of 400 balloon-borne weather stations will team up with NASA's Nimbus F satellite next year to gather meteorological information and to test the desirability of a permanent global armada of the floating installations.

Known as TWERLE (Tropical Wind, Energy Conversion and Reference Level Experiment), the project is a joint effort between the University of Wisconsin-Madison, Goddard Space Flight Center, and the National Center for Atmospheric Research. It will fill what Wisconsin space scientist Verner E. Suomi describes as an enormous gap in our ability to predict the weather.

"The earth's atmosphere is a closed system," Suomi explains. "To predict large scale weather patterns one must have information from all over the world.

"Conventional methods of observation cover only 15 per cent of this need and satellites alone are limited in their ability to help. A satellite can measure atmospheric temperature structure best in the polar regions where vertical temperature differences are large. Also it can follow wind motion by watching clouds but there are not enough clouds at most altitudes."

With a life expectancy of about six months before violent death in a thunderstorm or other disturbance, the balloons will keep constantly in touch with the weather satellite as they scatter around the world. Each balloon will regularly report its position and the atmospheric conditions it encounters, all to be relayed by the satellite to ground.

- more -

"Because balloons can go anywhere," Suomi points out, "they will be of especially great value in poorly monitored areas such as the southern hemisphere, where there are few ground stations because it's mainly water. And at whatever altitudes the balloons travel they will assume the role of clouds as floating markers of air motion."

Wisconsin's role in TWERLE primarily is the development and testing of special instruments that the balloons will carry, including radioaltimeters to measure altitude by bouncing radio pulses off the ocean, high-accuracy pressure sensors, and transmitters so precise that the satellite can measure the balloon's position and motion from apparent changes in the transmitter's frequency.

Having tested the devices on around-the-world flights, balloons sent up from Ascension Island in the South Atlantic last summer, the Wisconsin scientists are now overseeing manufacture of their instruments, preparing computer techniques to analyze data, and planning final testing of the weather stations prior to their 1974 launching.

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Release: 9 A.M. FRIDAY, DEC. 29 12/27/72

UIR SCIENCE WRITING PROGRAM
University-Industry Research Program (608--263-2876)

By JAN LAAN
UW Science Writer

WASHINGTON, D.C.--(Release 9 A.M. FRIDAY, DEC. 29)--Greatly improved weather forecasting will result from research now under way in the Global Atmospheric Research Program.

This is the prediction of Prof. Verner E. Suomi, director of the Space Science and Engineering Center at the University of Wisconsin-Madison.

The benefits of the program were outlined Friday by Suomi to those attending the annual meeting of the American Association for the Advancement of Science.

The program is a joint effort of the World Meteorological Organization and the International Congress of Scientific Unions.

It is set up around land-based weather stations, ships, buoys, balloons, and weather satellites. Its goal is to secure observations detailed enough for predictions of weather on a time scale longer than a few days.

Global observations are needed as input for mathematical models of the atmosphere which can be used for weather prediction. Observations are needed for the models, and models have been used to specify which observations are important.

"The use of such models has been one of the most significant advances in the last year," Suomi stated.

The cooperating countries, about 20 in all, hope to have put into orbit by 1977 five geostationary satellites giving continuous weather data. Polar satellites closer to the earth also are planned.

- more -

A sub-program is aimed for in the summer of 1974, the GARP Atlantic-Tropical Experiment. This will involve a network of 30 ships in the South Atlantic between South America and Africa gathering intensive weather data for a period of 100 days. Satellites, balloons, and ground-stations also will contribute data.

This study is needed, said Suomi, because satisfactory models are not yet available for the weather of the tropics. One focus will be cloud clusters, a form in which major updrafts (convection) take place in the tropics. These clusters are on the order of 1,000 km in length and are a key mechanism by which energy is distributed in the atmosphere.

Members of the Wisconsin group are participating in the fabrication of instruments for near-surface observations.

Tethered balloons which float at 1,500 meters above sea level and contain weather instruments are being constructed by the group. These stations weigh about one and one-half pounds each and will operate for several days on a small battery.

"Rain gauges presently are spread only very widely over the oceans," Suomi commented. "Better rainfall data are needed. We are looking at cloud structure as a means of estimating rainfall."

With this data available, it most likely will be possible to construct greatly improved computer models of weather for many regions of the world--and as a consequence greatly improve the accuracy of long-range forecasts.

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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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research
news

From the University of Wisconsin–Madison / University News and Publications Service, Bascom Hall, Madison 53706 / Telephone (608) 262-3571

Release: Immediately 7/24/72

UIR SCIENCE WRITING DIVISION
University-Industry Research Program
(608-263-2811, 2876)

By ROBERT EBISCH
UW Science Writer

Madison, Wis.--Venus and Mercury, closest planets to the sun, will be closely scrutinized for the first time next year by the electronic eyes of Mariner 10.

Mariner 10 will be unique as the first mission to send back television pictures of Venus and the first msssion ever to Mercury.

Two University of Wisconsin-Madison space scientists, Verner E. Suomi and Robert Krauss, are working as part of NASA's imaging team to make the TV cameras perform to the best possible advantage.

Last to be visited, Mercury will be tapped for information on the structure, composition, and cratering of its surface, but most important to Suomi and Krauss is the cloud-covered planet Venus.

By observing Venus' atmosphere they hope to learn about its atmospheric structure and the forces driving its atmospheric motions.

One mystery which they hope to solve is that of markings on the planet's face which are visible when observed through a filter passing only ultra-violet light.

Venus rotates once every 58 days, but these markings circle the planet in only four days -- in the opposite direction. Because they are visible and move at 200 miles per hour, a speed twice that of ehrth's jet stream, the markings are believed to be upper atmosphere phenomena.

-more-

Authorities speculate they may be large scale weather patterns.

On a more general level, Krauss explained that interest in the atmospheres of other planets is generated largely by interest in our own.

"The earth is very complex in its atmospheric structure," he said. "The planets offer interesting laboratories because their atmospheres are in many respects simpler than our own.

"Studying them and applying the acquired knowledge to the earth may be a faster way of getting at crucial facts than studying earth's atmosphere alone. It's like taking a very complicated problem, breaking it down into pieces, and solving each piece separately."

Mariner 10 was originally armed with only a single high-power camera lens to allww a close-up examination of Mercury.

But because the mission will be taking pictures from much closer when it looks at Venus, such a strong lens means that only a small area of the planet's surface could be recorded.

At Suomi's suggestion, engineers at NASA's Jet Propulsion Laboratory in Pasadena, Calif., fitted the powerful lens with a smaller lens attachment resembling a periscope, which can view almost 1000 times as much area.

As the mission passes Venus, that planet's gravity field will give it a course change toward Mercury, without which a larger rocket would be required for launching.

The satellite will finally go into orbit around the sun, hopefully to rendezvous with Mercury again six months later.

Scheduled for launch on Nov. 4, 1973, it will be the first such two-planet mission ever undertaken.

# # #

uw news

From The University of Wisconsin-Madison / University News and Publications Service, Bascom Hall, Madison 53706 / Telephone: (608) 262-3571

Release: Immediately 11/16/71 mm

MADISON--Prof. Verner E. Suomi, director of the University of Wisconsin-Madison Space Science and Engineering Center, has been appointed by Pres. Nixon to the first National Advisory Committee on Oceans and Atmosphere.

Suomi will join two dozen other nationally known experts from private industries, governmental agencies, and universities, to serve as a catalyst for new ideas and innovations and to give advice to the secretary of commerce regarding the National Oceanic and Atmospheric Administration.

A main concern of the committee will be the inter-relation between the oceans and the atmosphere. An expert in this field, Suomi explained:

"The oceans and the atmosphere are closely coupled systems. The oceans absorb heat from the sun and transport that heat up from the equator regions to the polar regions, such as the Gulf Stream does; and, the oceans transfer heat from the sun to vapor, and clouds and rain are formed. The winds give momentum to the ocean currents.

"If we are ever to tackle longer range weather predictions, such as seasonal forecasts, we will have to include the oceans in the forecasts."

He said the drought of the 1930s, which was not forecasted, might have been predicted if weathermen had had accurate information about weather over the oceans.

Suomi said scientists at the UW center had developed a device to measure the weather from balloons, and that such a device might work on buoys to provide the information weathermen need about the oceans.

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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 9/14/71 mm

MADISON--Wisconsin farmers, ski resort owners, construction workers, and other residents may be shaping the future of weather satellites.

Researchers at the University of Wisconsin-Madison Center for Studies of Educational Diffusion and Social Application of Space Telecommunications (EDSAT) are studying the impact of more accurate weather satellite information on such activities as highway construction, skiing, corn and hay production.

Recently the National Aeronautics and Space Administration granted $150,000 for the continuing study. Prof. Verner E. Suomi, director of the UW Space Science and Engineering Center, is principal investigator, and Dr. Delbert D. Smith is project manager.

"Our approach is to begin with the user and to work back in order to eventually be able to make suggestions as to the design and development of future satellite systems," Smith said.

"One of the more difficult problems to be faced by NASA and other decision-making agencies once users' needs are known will be to select priorities."

Smith explained that accurate two-week forecasts suitable for one industry may be used to the disadvantage of another industry, and that some decision would be required to determine which industry is more important.

EDSAT researchers hope to provide the information necessary to make such a decision.

Recently EDSAT published a two-volume interim report titled "Multi-disciplinary Studies of the Social, Economic and Political Impact Resulting from Recent Advances in Satellite Meteorology."

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The University of Wisconsin Institute for Environmental Studies 1225 West Dayton Street Madison 53706 Telephone: (608) 262-2860

news release

For release Wednesday, Jan. 13, 1971

1/12/71 mel

MADISON--Prof. Reid A. Bryson, director of the University of Wisconsin's Institute for Environmental Studies, was elected a fellow of the American Meteorological Society at its annual meeting in San Francisco Wednesday.

Those elected as fellows have made outstanding contributions to the science or application of meteorology, climatology, or other area of atmospheric science during a substantial period of years.

Wisconsin Profs. Heinz Lettau and Verner E. Suomi are also fellows of the organization.

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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 12/23/70 jb

MADISON--The American Institute of Aeronautics and Astronautics announced late Wednesday it would present its 1971 Robert M. Losey award to University of Wisconsin Prof. Verner E. Suomi.

The presentation, to be made Jan. 27 at the AIAA honors banquet in New York, is "in recognition of outstanding contributions to the science of meteorology as applied to aeronautics. . .and for Suomi's 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."

The award consists of a certificate of appreciation and an honorarium of $500.

A member of the UW faculty since 1948, Prof. Suomi serves as director of the multidisciplinary Space Science and Engineering Center on the Madison campus which he organized in 1966.

He served as chairman of the department of meteorology from 1950 to 1952 and from 1954 to 1957. Currently he is vice chairman of the U.S. Committee for the Global Atmospheric Research Program.

Prof. Suomi has conducted research on moisture measurements in the stratosphere, sonic anemometry and thermometry for studies of atmospheric turbulence near the ground, has invented radiation sensing devices and a lightweight radio

- more -

altimeter for balloon projects, and conducted extensive investigations into the energy budgets of the earth's surface.

He directed the UW team which developed radiation experiments for Explorer VII, the Tiros-Toss satellites, and devised instruments used on ATS-1 and 3 satellites.

Prof. Suomi, a member of the Venus-Mercury 1973 Imaging Science Team, currently is studying development of an atmosphere temperature sounder for the Synchronous Meteorological Satellite Program.

In recent years he received the Mesinger Award for aerological achievement and the Carl-Gustof Rossby Research Medal, the American Meteorological Society's highest award.

# # #

DEC 23 1970
YES

AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS

1290 AVENUE OF THE AMERICAS
NEW YORK, N.Y. 10019
AREA CODE 212
581-4300

December 21, 1970

Professor Verner Edward Suomi
Director, Center for Space Science
and Engineering
The University of Wisconsin
Madison, Wisconsin 53706

Dear Professor Suomi:

The American Institute of Aeronautics and Astronautics annually presents the AIAA Robert M. Losey Award which is presented "in recognition of outstanding contributions to the science of meterology as applied to aeronautics." It is my pleasure to inform you that you have been selected to receive this award for 1971.

This award is being presented to you for "your creativity and ingenuity in designing advanced meteorological sensors for satellite applications as exemplified by your Spin-Scan camera which has made it possible to view the earth's atmosphere as an entity." The award consists of a certificate of appreciation and an honorarium of $500.

The award will be presented at the Honors Banquet, Wednesday, January 27th, during the AIAA 9th Aerospace Sciences Meeting at the Statler Hilton Hotel in New York. Cocktails will be at 7:00 P.M. and dinner at 7:45 P.M. The Officers and Board of Directors cordially invite you to attend the Banquet as one of the honored guests.

Sincerely,

George S. Schairer

George S. Schairer
Chairman, AIAA
Honors and Awards Committee

GSS:rs

uw news

From The University of Wisconsin News and Publications Service, Bascom Hall, Madison 53706 • Telephone: (608) 262-3571

Release: Immediately 4/30/70 rf

MADISON--Fifty representatives of industry and government met with faculty members of the University of Wisconsin College of Engineering's chemical engineering department Thursday at a University-Industry Symposium to discuss problems now facing education.

Prof. Verner E. Suomi, director of the Space Science Center, addressed the dinner meeting of the symposium in the Wisconsin Center on "Weather Prediction in the Seventies."

Eight UW chemical engineering faculty members, including Profs. C.A. Coberly, S.H. Langer, E.N. Lightfoot, R.B. Bird, S.L. Cooper, T.W. Chapman, R.R. Hughes, and W.R. Marshall, were speakers at various sessions.

They discussed kinetics and thermodynamics, separation processes, fluid and particle mechanics, materials, electrochemistry, process design and economics, and process dynamics and development.

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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 4/9/70 rf

MADISON--Four members of the University of Wisconsin College of Engineering faculty at Madison have now been elected to the National Academy of Engineering since the academy was established in 1964.

Latest to gain the honor is Prof. Gerard A. Rohlich, civil engineering, director of the Water Resources Center and former director of the Institute for Environmental Studies.

Election to the academy is the highest professional distinction that can be conferred upon an American engineer, and honors those who have made important contributions to theory and practice or who have demonstrated unusual accomplishments in the pioneering of new and developing fields of technology.

Other UW faculty members elected previously include Profs. Verner E. Suomi, meteorology, director of the Space Science and Engineering Center, elected in 1966; W. Robert Marshall, chemical engineering, associate dean of the College of Engineering and executive director of the Engineering Experiment Station, elected in 1967; and R. Byron Bird, Charles F. Burgess Professor of Chemical Engineering, elected in 1969.

- more -

Dr. Rohlich was cited for his engineering and educational contributions to improving man's environment. He received his B.S. degree in 1934 from Cooper Union School of Engineering, the B.S. in 1936 and M.S. in 1937, and the Ph.D. degree in 1940, all from Wisconsin. He has been a member of the faculty here since 1946.

Dr. Rohlich was the recipient of the Harrison Prescott Eddy Medal of the Water Pollution Control Federation in 1955, and the George Warren Fuller Award of the American Water Works Association in 1968. He is a fellow of the American Society of Civil Engineers and a member of the Water Pollution Control Federation, American Water Works Association, National Society of Professional Engineers, American Society for Engineering Education, and Sigma Xi honorary science society.

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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 5/16/69 rf

MADISON--Prof. Verner E. Suomi, meteorology, director of the University of Wisconsin's Space Science and Engineering Center, will give the main address at the annual Madison dinner of Phi Beta Kappa, national honor society, next Wednesday.

The 111 UW students elected to membership in the society this spring will be initiated at 5:30 p.m. in the Union's Old Madison Room. The dinner will follow at 6:30 p.m. in Great Hall of the Union.

Prof. Suomi, who will become an honorary member of the society at the initiation, will speak on the topic, "Looking at the World's Weather."

Prof. L.E. Pfankuchen of the political science department, president of the Wisconsin chapter of Phi Beta Kappa, will be toastmaster.

Mrs. Angela B. Bartell, law student from Madison, will speak for the seniors, and Timothy D. Fenner, junior in letters and science from Eau Claire, will speak for the juniors.

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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 4/10/69 rf

MADISON--Dr. R. Byron Bird, Charles F. Burgess Distinguished Professor of Chemical Engineering at the University of Wisconsin, has been elected to the National Academy of Engineering.

Election to the academy is the highest professional distinction that can be conferred upon an American engineer, and honors those who have made important contributions to engineering theory and practice or who have demonstrated unusual accomplishments in the pioneering of new and developing fields of technology.

Prof. Bird is the third faculty member on the UW's Madison campus to be elected to the academy since it was established in 1964. The others are Profs. Verner E. Suomi, meteorology, director of the Space Science and Engineering Center, elected in 1966, and W. Robert Marshall, chemical engineering, executive director of the Engineering Experiment Station, elected in 1967.

Dr. Bird was cited for his outstanding contributions in the fields of transport phenomena and rheology (the mechanical behavior of fluids). He received his B.S. in chemical engineering from the University of Illinois in 1947 and was awarded his Ph.D. in physical chemistry at Wisconsin in 1950.

A member of the faculty here since 1953, he has received three Fulbright grants for study in Holland and Japan.

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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.

- more -

Add two--space building

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.

- more -

"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."

###

Verner Suomi

THE CAMERA SYSTEM ON BOARD THE SATELLITE

The final choice for the camera was based upon time and eventual usefulness. Since little over a year's time remained for the whole system to be designed, it had to be as simple as possible while still being capable of achieving the desired results. A spin scan camera was the final choice.

The ATS-B satellite is in the shape of a cylinder with a flat top and bottom. While in orbit, it spins about its axis which is oriented parallel to the earth's spin axis. The camera is mounted inside of it and looks out through a small hole in the satellite's side. As it rotates, the camera gets only a quick "glance" at the earth once each satellite revolution.

The mirror and aperature of the camera, built by the Santa Barbara Research Center, are arranged so that it has a very small field of vision. When the camera is pointed towards the earth, this corresponds to a circular area on its surface about 2.2 miles in diameter. Unlike a conventional camera, the image it sees is not focused on photographic film. Instead it is focused on a photomultiplier tube which measures the light intensity of the image and converts it into a proportional electrical voltage. Thus as the satellite spins, the camera scans a long narrow path across the earth, 2.2 miles wide and extending east to west from horizon to horizon.

After the scan is made, the camera is automatically tilted in the north-south direction so that on the next revolution it will scan a path on the earth adjacent to the last. This process is repeated until the whole earth between 50° latitude is scanned. The corresponding electrical signals from the photomultiplier tube are then sent back to earth where they are processed and fed into a facsimile machine to reproduce the picture. The satellite will spin at 100 revolutions per minute. Since the pictures are going to be made up of 2000lines, each one will take about 20 minutes to "expose".

- more -

Add one--satellite

The ATS satellite now in orbit will take horizon-to-horizon pictures of the earth. If the experiment succeeds, the Wisconsin scientists will have scored a prestige gain for the U.S. as well as having achieved many meteorological advances.

The proposed experiment was a consequence of a Weather Bureau funded research project at the University. Research was being done in atmospheric energetics and indicated a definite need for such a camera.

Its purpose is to continuously monitor weather motions over a large portion of the earth's surface. Understanding weather circulation on a global scale is the key to better weather prediction.

To continuously monitor the weather, the satellite must remain stationary with respect to one part of the earth for a long period of time. This can only be accomplished by using a synchronous satellite. This traverses its orbit in the same direction and at the same rate as the spin of the earth, and so remains stationary with respect to the earth.

Because of the great speed that it must maintain to stay in such an orbit, the laws of mechanics insist that this satellite be located about 22,000 miles from the surface of the earth.

Previous weather satellites provided pictures of weather motions, but since these were mainly polar orbiting satellites, the life history of particular weather conditions could not easily be determined.

The camera on the ATS-B satellite will provide pictures of the earth covering the whole area in one hemisphere between 50 degrees north and south latitude. This area includes the tropics, which is about half the world's area and is about 75 per cent ocean. Here is where polar orbiting satellites such as the TIROS series have the greatest gaps in their data, and surface observations are most sparse.

- more -

According to Prof. Suomi the tropical region is the "boiler" of the giant atmospheric engine. Convection, or the vertical movement of heat by the atmosphere, plays an all important role in the transfer of heat from the tropics to the colder regions of the earth.

The key to weather prediction is the motion of air masses. Since the air itself cannot be observed directly, the movement of cloud systems provides the next best information. A high resolution synchronous satellite can provide this information better than any other type of observation. As a result of this, the ability to extract cloud motion from a series of pictures was of paramount importance in choosing the system to be used.

Some of the interface equipment for the Mohave, Calif., ground station and the precision display equipment to be used at Madison is being designed and built by members of the UW Space Science and Engineering Center here.

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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 2/20/68 jb

SHEBOYGAN--The director of the University of Wisconsin Space Science and Engineering Center, Dr. Verner E. Suomi, will address the UW Alumni Club of Sheboygan County Feb. 29.

The annual Founders Day dinner, established to mark the day classes first met on the Madison campus of the University in 1849, will be held at Marty's Flamingo Club, Sheboygan, beginning with a 6 p.m. social hour. Dinner will follow at 7 p.m.

Reservations, at $3.75 each, should be made at once with William J. Anderson, 2636 N. 5th st., Sheboygan. Tom Manning is president of the club.

One of the nation's foremost meteorologists, Prof. Suomi is a member of the subcommittee on meteorological satellites on the Space Science Board of the National Aeronautics Space Administration. In 1965 he was invited to become a member of the Finnish Academy of Sciences and Letters, one of the highest honors accorded an American man of science.

Prof. Suomi will speak on the U.S.A. space program, particularly stressing what is in store in the battle of space.

A member of the UW faculty for 20 years, he has designed a number of instruments now airborne in America's Tiros II, III, and IV. He also serves as chief scientific adviser of the U.S. Weather Bureau and as a member of the Atmospheric Sciences panel of the National Science Foundation and as editor of the Journal of Applied Meteorology.

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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 2/28/68 jw

UIR Science Writing Division (262-5984)

MADISON--Orbiting astronauts can be very helpful to ground-based weathermen, meteorologist Verner E. Suomi pointed out Monday at the Manned Space Flight Center in Houston.

Suomi, director of the University of Wisconsin's Space Science and Engineering Center, spoke to the scientist-astronauts chosen last August by the National Aeronautics and Space Administration.

Suomi told the astronauts that their observations above the globe would be valuable in helping to construct a model for the weather over the entire world. He also noted that excellent and useful photographs have come from the manned space flight program.

To further his goal of a world-wide weather network, Suomi has also helped plan two cameras which are now orbiting the earth and taking photographs of clouds covering entire hemispheres.

Robert A. Parker, an astronomy professor at the University of Wisconsin, is one of the scientist-astronauts.

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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 4/11/68 jb

ASHLAND--Dr. Verner E. Suomi, director of the University of Wisconsin Space Science and Engineering Center, will be the headline speaker at the annual Founders Day dinner-program of Chequamegon Bay area alumni April 29.

The program, established to mark the day classes first met on the Madison campus of the University in 1849, will be held at the Scotty Club Gold Room near the junction of U.S. Highways 2 and 13. A social hour will begin at 6:30 p.m.

Reservations, at $4 each, should be made at once with Ronald M. Harris, 504 W. 11th st., Ashland 54806.

One of the nation's foremost meteorologists, Prof. Suomi is a member of the subcommittee on meteorological satellites on the Space Science Board of the National Aeronautics Space Administration. In 1965 he was invited to become a member of the Finnish Academy of Sciences and Letters, one of the highest honors accorded an American man of science.

Prof. Suomi will speak on the U.S.A. space program, particularly stressing what is in store in the battle of space.

A member of the UW faculty for 20 years, he has designed a number of instruments now airborne in America's Tiros II, III, and IV. He also serves as chief scientific adviser of the U.S. Weather Bureau, as a member of the Atmospheric Sciences panel of the National Science Foundation, and as editor of the Journal of Applied Meteorology.

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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 4/23/68 jb

MADISON--Dr. Verner E. Suomi, director of the University of Wisconsin Space Sciences and Engineering Center, will discuss the UW-developed ATS-3 Weather Satellite Friday, April 26, at 8 p.m.

He will address the Wisconsin section, American Institute of Aeronautics and Astronautics, meeting at the Wisconsin Center in Madison for the first time.

Dr. Suomi, who also serves as professor of meteorology and chairman of the National Academy of Engineering-National Academy of Sciences, originally proposed the satellite and conceived the space center for the University of Wisconsin.

He will outline a satellite mission and show films of it in space, some 22,300 miles above the equator. It locates storm centers and tracks them as they begin, mature, and decay.

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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 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.

- more -

Add one--Satellite

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 10/27/67 mes

UIR Science Writing Division (262-5984)

MADISON--University of Wisconsin Prof. Henry H. Barschall of physics has been named chairman-elect of the newly-formed Division of Nuclear Physics of the American Physical Society.

Prof. Barschall, of 1110 Tumalo Terrace, Madison, will become the head of the 1,000-member division in April, 1968, when the American Physical Society will hold its annual meeting in Washington, D. C.

The Division of Nuclear Physics held its first annual meeting in Madison this week, with more than 500 nuclear physicists in attendance. Prof. Verner E. Suomi, of the Wisconsin meteorology department's Space Science and Engineering Center, spoke on weather modification at the banquet Tuesday evening.

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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 12/7/66 jl

UIR Science Writing Division

By JAMES A. LARSEN

MADISON, Wis.--Cape Kennedy--A synchronous weather satellite camera conceived by University of Wisconsin scientists was placed in a parking orbit at a height of 22,000 miles over the earth Tuesday.

The camera system, to be used by University scientists Verner E. Suomi and Robert J. Parent, is designed to hover continuously at a point over the earth and transmit photographs of weather every 20 minutes.

The satellite is not now in final position--which will be over the equator south of Hawaii--but will be moved there gradually over the next two weeks.

"A considerable portion of the launch process is behind us, but we have a long ways to go," cautioned Prof. Suomi in commenting on the launch Wednesday.

The project is financed by the National Aeronautics and Space Administration (NASA) as part of the drive to find ways to exploit space for useful purposes. The U.S. Weather Bureau financed work on the prototype of the satellite.

The Applications Technology Satellite (ATS) project is the first major multi-faceted attack that NASA has made in the effort to obtain an economic return on the U.S. investment in space.

The Goddard Space Flight Center will launch five satellites within the next two years as a part of this project. Four of these satellites will be in synchronous orbits and appear to hold much promise for meteorological, communications, and other research. The second satellite will be in a medium range non-stationary non-synchronous orbit.

- more -

Add one--satellites

ON-BOARD EQUIPMENT

The camera and associated equipment were fabricated by the Santa Barbara Research Center, under a subcontract with the University of Wisconsin. Roger Thompsen was the project engineer.

The camera itself consists of just a 10-inch focal length reflecting telescope and a photomultiplier tube. The image is focused on the photomultiplier tube and then converted to an electrical signal as was described above. The whole unit weighs less than 20 pounds.

Because of the extreme temperatures encountered in space, the camera had to be fabricated out of special materials in order to maintain the high resolution necessary for good pictures. Ordinary materials change dimensions with changes in temperature, and at the extremes encountered in space, would have a marked effect on the focus of the camera. To eliminate this problem, a nearly expansion-free metal called invar was used for all critical parts.

Another type of distortion, even more critical than the type caused by expansion of materials, can occur because of nutation of the spin axis. Nutation is common to all free spining objects like tops and synchronous satellites, and an example of it is the nodding that occurs when a top is disturbed from its equilibrium position.

For certain technical reasons, nutation of the ATS-B satellite will occur at a much slower rate than its rate of spin, and all scans will still remain strictly longitudinal. However, because of this nodding, consecutive scans will not necessarily be adjacent ones and individual scans may be displaced from their true position.

There are several methods available to remove the error nutation may introduce, but there is no way existing whereby ground-based stations can completely recover all data "confused" by nutation.

- more -

If two adjacent scan lines or two wider spaced scan lines have identical scan paths over the earth's surface, then two lines of data will contain the same information. Knowledge of the exact nutation motion would make it possible to re-position these lines, but it will not fill in the missing gaps.

Once the spacecraft is in orbit, it will be under the control of the ground station. After the command is given to energize the camera and its associated amplifiers, the taking of pictures will automatically begin. As the camera makes the first scan across the earth's surface, the signal from the photomultiplier tube will be amplified and then sent back to earth by a microwave radio transmitter on board the satellite.

After the scan is made a sensor on board the satellite will inform the camera stepping device that the scan has been made and the camera stepping motor will advance the camera so it will be ready for the next scan. This process is repeated until the whole area is scanned, after which the camera is automatically repositioned for the next picture.

The data from the pictures will be collected by a North American ground terminal for immediate processing. Although the resolution of the camera is two nautical miles, resolution for most pictures will probably be no more than four or six nautical miles since this is the best the facsimile machines can furnish. Experimenters can obtain two mile resolution if they wish, however, they must be content with looking at a limited portion of the earth's surface to do so.

Prof. Suomi intends to preserve two-mile resolution of the whole area for some pictures but he will have to record the data and use a digital machine to process it. The satellite will obtain power from solar cells on its cylinderical surface and will have enough power to take pictures on a continuous basis.

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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.

-more-

add one--Space Science and Engineering Center

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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U.W. NEWS

From The University of Wisconsin News and Publications Service, Bascom Hall, Madison 53706
Telephone (Area Code 608) 262-3571 Release:
2/21/66 jb Immediately

MADISON, Wis.--Five of the University of Wisconsin's top men of science will join Astronauts James A. Lovell Jr. and Donald K. Slayton in a 75-minute Space-Science panel program to be telecast by WHA-TV on Thursday (Feb. 24).

To begin at 2 p.m., the program will be telecast live, and also close-circuited over Channel 5 (VHF) to campus classrooms. It will be repeated over WHA-TV (Channel 21, UHF) at 9 p.m. the same day. It also is being offered to Wisconsin commercial stations.

The special program will be one activity in a busy day for the honored guests in Madison. They and their wives will be guests of the State and the University.

Dr. Robert L. Clodius, vice president of the University, will moderate the panel program. The faculty participants will be:

Prof. Bruno Balke, physiology and men's physical education, internationally-known for his findings in the area of body stresses in sports and high altitude activity;

Prof. Lowell R. Doherty, astronomy, an innovator in high altitude-manned aircraft observation research;

Dr. Hector F. DeLuca, biochemistry, Harry Steenbock Research Professor at the University, who has conducted extensive studies on Vitamin D;

Prof. James J. Skiles, electrical engineering, whose specialties include electrical power and computing calculations; and

-more-

Add one--astronauts

Prof. Verner E. Suomi, meteorology, widely cited for his weather satellite experiments.

Prof. James F. Crow, genetics, former acting dean of the Wisconsin Medical School, was chosen as alternate.

WHA-TV officials said the program would begin with a documentary film of the astronauts' December Gemini 7 flight into space. Capt. Lovell and Maj. Slayton will proceed to answer questions asked by the panelists.

The TV program will be one of three events planned for the guests on the Madison campus. They will appear as lecturers before University engineering students and 100 selected high school science students at the Wisconsin Union at 10:45 a.m., and at 4:15 p.m. show Gemini 7 films and speak briefly at the Badger Fieldhouse, where more than 8,000 students, Madison area residents, and others are expected.

At the Union program, Capt. Lovell, whose home is in Milwaukee, will receive the University's Distinguished Service Citation. Based on his achievements in space exploration, engineering, and science, the award honors the former Wisconsin College of Engineering student who was on the Madison campus from 1946 to 1948.

Gov. Warren P. Knowles will host the astronauts' visit to the State Capitol rotunda at noon, where state officials and employees will greet the distinguished visitors.

At an evening program at the Loraine Hotel, Capt. Lovell and Maj. Slayton will be honored by the Wisconsin Society of Professional Engineers.

The spacemen will arrive at Truax Field at 9 a.m., Thursday.

##

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.

-more-

U.W. NEWS

From The University of Wisconsin News and Publications Service, Observatory Hill Office, Madison 53706

Telephone (Area Code 608) 262-3571 Release: **Immediately**

7/22/65 nh

MADISON, Wis.--The National Aeronautics and Space Administration has awarded a grant of $900,000 in support of space-oriented research at the University of Wisconsin.

The grant was announced by Dean Robert A. Alberty of the Graduate School and Prof. Joseph O. Hirschfelder, director of the University's Theoretical Chemistry Institute, the principal investigators.

Of the grant, $400,000 provides continuing support for NASA sponsored research in the Theoretical Chemistry Institute, while $500,000 will support new multidisciplinary research in space science and engineering areas.

"Specific projects involve research in the natural sciences, social sciences, medical sciences and engineering. Some of their work is basic and some is applied research," the investigators point out.

This grant will help bring more of the University faculty into contact with space research problems and opportunities," they added.

The Theoretical Chemistry Institute, largest facility of its kind in the world, has an interdisciplinary staff of nine professors and 10 visiting scientists and a current enrollment of 26 graduate students. Established in 1962 with the aid of a NASA grant, the Institute has produced more than 100 technical reports in the fields of molecular quantum and statistical mechanics.

-more-

With the use of high speed computing machines and advanced mathematical methods, the theoretical chemistry group seeks to predict the chemical and physical properties of materials under extreme conditions of temperature and pressure, to relate these macroscopic properties to the individual molecules, and determine individual molecular structure and properties. In carrying out this work, the Theoretical Chemistry Institute has been aided greatly, Prof. Hirschfelder said, by the collaboration of the Army Mathematical Research Center, the University Computing Center in Madison, and many other departments.

(In addition to the present $400,000 grant, NASA recently gave the University $359,000 for theoretical chemistry facilities in the new Chemistry building now being constructed on the Madison campus.)

Most influential in securing NASA support, the investigators said, were the successful space area projects developed at Wisconsin. These include the Tiros weather observational satellite instruments conceived by Profs. Verner E. Suomi, meteorology, and Robert J. Parent, electrical engineering; the astronomical observatory with three telescopes, scheduled to be placed in orbit in 1966, the work of Prof. Arthur D. Code and his colleagues in the astronomy department; and the research programs of the Theoretical Chemistry Institute under Prof. Hirschfelder.

The $500,000 provided by NASA for new space research will support 31 specific projects in seven major areas:

Aerodynamic problems in rocket engines; ion acceleration and plasma problems; mechanical functioning of space hardware; simulation of space environment; space communications; space medicine and man's behavior in space; and upper atmosphere and extraterrestrial research.

Projects were selected from a large number of proposals submitted from various University departments by the University's Committee on Space Sciences, with Dean Alberty and Prof. Hirschfelder as chairmen. Other members:

-more-

Add two--NASA grant

Madison--Profs. Robert M. Bock, biochemistry; Verner E. Suomi, Everhard Wahl, and Reid A. Bryson, meteorology; Arthur D. Code, astronomy; James F. Crow, medical genetics; Leon D. Epstein and Ralph K. Huitt, political science; David T. Graham, medicine; Raymond G. Herb and Hugh T. Richards, physics; Charles C. Holt, economics; Karl E. Krill, special assistant to University Pres. Fred Harvey Harrington; Millard W. Johnson, engineering mechanics; W. Robert Marshall, Engineering Experiment Station; Van R. Potter, oncology; J. Barkley Rosser, mathematics.

Milwaukee--Michael M. Shurman, associate dean, Letters and Science; and John H. Smith, commerce.

The selected projects are in chemical engineering, mechanical engineering, physics, mathematics, engineering mechanics, civil engineering, electrical engineering, economics, UW Computing Center, psychology, radiology and physics, medicine, biochemistry, pharmacy, pathology, chemistry, and astronomy.

The grants await formal acceptance by the University Board of Regents in August.

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MADISON NEWS

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON, WISCONSIN 53706

7/30/65 mcg

RELEASE: Immediately

MADISON--Four University of Wisconsin experts on space will discuss "Where We Stand in Space" on the Roundtable program over WHA-TV and the State FM network at 8 p.m. Monday (Aug. 2).

Speakers will be Profs. Arthur D. Code, astronomy, Verner E. Suomi, meteorology, Robert M. Bock, biochemistry, and Robert J. Parent, electrical engineering. They will present an informal discussion of the scientific advances resulting from space exploration to date and those likely to result in the future. All have played important roles in the experimentation underlying the U.S. space program.

Prof. Roy Vogelman is program planner and moderator.

##

U.W. NEWS

From The University of Wisconsin News and Publications Service, Observatory Hill Office, Madison 53706

Telephone (Area Code 608) 262-3571 Release:

3/30/65 jl AMS, April 2

by James A. Larsen

MADISON, Wis.--A chemical used commonly for fertilizer has proved unusually promising in cloud-seeding experiments to produce snow or rain from water-laden clouds.

The chemical, urea, which is readily available and inexpensive, was tested this winter over northern Wisconsin, and has proved to be unusually effective in triggering release of snow from relatively thick, heavy layers of stratus clouds.

The University of Wisconsin scientist conducting the work, Robert Knollenberg, a graduate student in the UW Department of Meteorology, developed the new method of cloud seeding while attending The University of Chicago as a traveling scholar through a program provided by the Committee on Institutional Cooperation.

The developmental work was conducted last November and December at The University of Chicago under Professor Roscoe Braham of the Department of the Geophysical Sciences. At Wisconsin, further testing will be conducted under the joint direction of Knollenberg and Professor Verner E. Suomi of the UW Department of Meteorology.

The CIC plan under which Knollenberg conducted the work at Chicago is a program under which graduate students from one school can study at another to gain wider experience.

(more)

Add one--Cloud seeding

While in Chicago, Knollenberg was employed as a research assistant under a National Science Foundation grant awarded to Braham for cloud seeding studies.

Urea possesses chemical properties which make it unusually effective for triggering the formation of ice nuclei in super-cooled clouds--the initial step in a chain of physical processes which result in snow formation.

Once formed, the nuclei grow into snowflakes which then fall to the ground. This is also essentially the process by which rain is formed in many types of clouds, excepting as the snow falls downward into warmer layers of air, it melts and forms small drops which grow as they collide with one another.

While the process has not been tested during summer, when rain rather than snow would be the ultimate result, it is anticipated that seeding with urea will prove to be as effective then as in the winter trials.

Meteorologists are careful to emphasize, however, that cloud seeding cannot be expected to produce miracles. Moist clouds must be present of the type that might produce rain anyway. But the seeding releases the rain when and where it is wanted.

Knollenberg hit upon urea as a potentially useful cloud seeding chemical because of experiences as a youth on his family's Illinois farm. He remembered that urea used for fertilizer readily absorbs water from the air--a property which helps make a chemical a good seeding material.

Testing urea in a laboratory cloud chamber at Chicago, he found that it was unusually capable of causing nucleation under conditions simulating those in the atmosphere. Subsequent testing from an aircraft over Wisconsin showed that it worked equally well in natural clouds.

(more)

Add two--Cloud seeding

Previously, seeding has been conducted with the use of two well known chemical agents, silver iodide and dry ice. The former is used most often in seeding from the ground, because it can be set up as smoke which rises into the clouds and causes nucleation.

Dry ice has often been used for seeding from aircraft. Both chemicals are somewhat difficult to handle, and silver iodide especially is more expensive than urea. Reagent grade urea costs about five cents a pound, compared with about eight cents for dry ice, and $20-$30 for silver iodide. Part of this advantage is lost, however, by the fact that silver iodide produces many more snowflakes per pound than can be expected from urea, at least at colder temperatures.

Other individuals have tested urea in the laboratory as a potential seeding agent, but missed its value because testing methods did not reveal the small initial nuclei formed in cloud chambers. Knollenberg used a method for detecting nuclei which is more effective, and found that urea does, indeed, form ice nuclei in supercooled clouds and does so very effectively.

In his tests, he placed a supercooled solution of sugar in the test chamber. When the all-but-invisible ice nuclei were formed, they fell into the sugar. There they grew rapidly, indicating that they were present in large numbers. Other methods use optical techniques of detection, and are not as effective at revealing the presence of certain types of ice nuclei.

Urea is also particularly effective as a seeding agent because it possesses what is termed a high endothermic heat of solution. That is, it markedly cools the solution into which it dissolves. Thus, when dumped into a cold cloud, it cools the droplets that the urea crystals dissolve in. This results in rapid formation of ice nuclei.

(more)

Add three-Cloud seeding

Because of this property, urea is effective in causing formation of ice nuclei at temperatures near or even above freezing under some conditions. The laboratory tests indicate that urea will induce ice formation in all supercooled clouds. A supercooled cloud is one in which the temperature is below freezing, but in which, because of certain physical properties of water, freezing has not occurred.

The laboratory results were checked during February and March on winter clouds over northern Wisconsin. In clouds about 3,000 feet thick, extending from approximately 3,000 feet to 6,000 feet in altitude, two tests were conducted in the area west of Rhinelander and a third in the area south of Eau Claire. These tests were carried out in a University of Chicago airplane which is used in Braham's studies of cloud physics.

For the purpose of seeding, reagent grade urea is first pulverized and then dropped from an aircraft. The turbulence caused by the propeller of the plane effectively spreads the seeding material over a relatively wide area.

In one test, seeding with urea and dry ice were compared, and the urea was shown to be at least as effective as dry ice. It is believed that urea's real value will lie in its ability to nucleate supercooled clouds that are just below freezing where neither dry ice nor silver iodide is effective.

The scientists were enthusiastic about the outcome of the tests even though the amount of snow produced at the ground was too small to be measured. The tests are regarded as just one of many steps required in the development of techniques which eventually may provide man with a useful degree of control over weather.

The cloud seeding research at The University of Chicago and The University of Wisconsin is part of a nationwide research effort sponsored by the National Science Foundation aimed at improving the country's water resources by finding ways of increasing the amount of rain and snow which reaches the ground.

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U.W. NEWS

From The University of Wisconsin News and Publications Service, Observatory Hill Office, Madison 53706
Telephone (Area Code 608) 262-3571 Release: Immediately

5/24/65 mes

MADISON, Wis.--Prof. Verner E. Suomi of the University of Wisconsin department of meteorology has received one of the highest honors an American scientist can receive from Finland.

He has been invited to become a member of the Finnish Academy of Sciences and Letters--an honor usually reserved for high-ranking Finnish professors and scientists. The number of foreign scientists accepted into the body is very small.

Prof. Suomi, noted for his weather satellite experiments, has spoken in Finland several times. He has an even closer connection with this Scandinavian country, because his name "Suomi" in the Finnish language means "Finland."

Last July he was appointed the first chief scientist for the United States Weather Bureau, and he is currently on leave from the University for one year to fill that positin. He has been teaching at Wisconsin for 16 years, becoming a full professor in 1958.

Prof. Suomi is the leading space scientist on the University campus. Instruments which he developed have been whirling around the world since the advent of American efforts in the space age. One instrument which he helped develop, the Suomi-Kuhn Radiometer, is making possible more accurate long-range weather forecasting.

He is also an authority on new techniques of "cloud control," with which man may someday modify the weather for peaceful uses.

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U.W. NEWS

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON, WISCONSIN 53706

RELEASE:

2/16/65 nh Immediately

SCIENCE NEWS

MADISON, Wis.--An international group of meteorologists will assemble at the University of Wisconsin on March 22 to compare data and instruments relating to thermal radiation studies of the upper atmosphere.

Sponsored by the International Association of Meteorology and Physics (IUGG) through its Radiation Commission and the World Meteorological Organization (WMO), the scientists will conduct a series of standardization tests with balloon-borne radiometers used for basic studies of long-wave radiation flux in the atmosphere on a world-wide basis. With such standardization, radiometer data from foreign networks can be used by each country's participating scientists in their own research on radiation balance and the overall heat budget of the earth.

These studies are believed to be basic to the development of atmospheric circulation patterns, long-range weather forecasting, and in the interpretation of satellite data used in weather research. Since no country can now secure sufficient data on a global scale, international cooperative research is being advocated by the scientists.

Thermal radiation effects account for an estimated 25 per cent or more of the energy driving the atmosphere and even small differentials of radiant energy levels--as little as five watts per square yard--could be significant for weather changes. While large radiation differentials are more directly causative in large weather change, research indicates that small differences often operate as triggering mechanisms which can set off other changes in a chain-like reaction. Hence, radiative phenomena occurring in one part of the world may often determine later weather conditions in another.

-more-

Add one--meteorologists

Fundamental understanding of terrestrial (thermal) radiation in its relationships to global weather will hopefully enable man to forecast longer in advance, and with increased accuracy. It will also provide a more reliable means of predicting change for smaller geographical areas, particularly important to agriculture and transportation operations.

Multiple, large-scale thermal radiation study of the upper atmosphere in weather science is a fairly recent development and the University of Wisconsin is the U.S. leader in this field. The radiometer used in such research conducted jointly by the University and the U.S. Weather Bureau was developed by Wisconsin meteorologists Verner E. Suomi and Peter M. Kuhn and is now manufactured by the Johnson Service Co., Milwaukee. This radiometer will be used by the U.S. scientists in the standardization tests.

Dr. Suomi is presently on leave from Wisconsin to serve as chief scientist to the U.S. Weather Bureau in Washington, D.C. He is now represented by Prof. Eberhard W. Wahl of the department of meteorology. Dr. Kuhn is the Weather Bureau research scientist assigned to the department of meteorology at the Universiy of Wisconsin.

Invitations sent by the sponsoring international meteorological agencies have been informally accepted by the four leading countries conducting long-wave radiation research. In addition to the U.S., they are West Germany, Japan, and Russia. T o scientists from each country will participate. Observers from Canada, which is working with the U.S. Weather Bureau in a joint research program, and from England are also expected.

The group will gather in Madison on March 22 with the University of Wisconsin's department of meterology acting as host. Dr. Kuhn is responsible for setting up the conference agenda and carrying out the intercomparison tests.

On the following day, the group will travel to Milwaukee to see how the U.S. radiometer is made at the Johnson Service Co. plant and will tour the city as guests of the firm.

-more-

Add two--meteorologists

The intercomparison tests will be made beginning March 24 at the Weather Bureau airport station in Green Bay, Wis. Each group of scientists will fly his instrument by balloon and document its performance.

Following these tests, scheduled for four days, the scientists will travel to Miami, Fla. to visit the U.S. Hurricane Research Center where further standardization flights in a semi-tropical atmosphere will be conducted. While there, the group will also visit the national hurricane research project of the Weather Bureau.

Returning to Madison on April 3, the scientists will present evaluations of the flight performances and prepare standardization procedures. It is anticipated that a joint publication will be subsequently issued through the sponsoring international agencies.

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U.W. NEWS

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON, WISCONSIN 53706

RELEASE:

BACKGROUND MATERIAL ON INTERNATIONAL
MEETING OF METEOROLOGISTS AT THE
UNIVERSITY OF WISCONSIN, MADISON,
BEGINNING MARCH 22, 1965

2/16/65 (radiometer)

Twice a day at weather stations across the United States and key points around the world, a six-foot helium-filled balloon lifts a small cardboard box into the upper atmosphere.

The box, about the size of a package of breakfast cereal, is called a 'radiosonde' and holds sensitive instruments which measure temperature, humidity, and air pressure as the balloon soars to its destination in the stratosphere, some 20 miles up.

These measurements are converted into electrical impulses which modulate the ultra short-wave frequency continuously broadcast by a tiny radio transmitter in the package. With a range of 200 miles, these signals are picked up by the home station and translated back into instrument readings. Meanwhile, radar tracks the radiosonde and provides continuous information on altitude, wind direction and velocity.

Now the total flight record becomes a tiny data-unit which is fed into an accumulative flow of information from the U.S. weather station network and other meteorological sources on land, sea and in the air, aggregating half a million measurements weekly on atmospheric conditions around the earth.

Fed into computers and related to past weather behavior, this is the information system which enable the U.S. Weather Bureau to calculate its 12-hour aviation forecasts, 24-hour detailed forecasts, general 5-day forecasts, 30-day general outlook and a variety of special reports, weather maps, frost and storm warnings for transportation services, agriculture and industry--and achieve an accuracy of 85 per cent or better on its short-range predictions.

-more-

This is a remarkable achievement. For in attempting to forecast weather, man deals with a complexity of forces and events he is just beginning to understand, with a variety and quantity of data whose inter-relationships must be empirically recognized, and with unknown factors and influences operating in dimensions which approach infinity--the atmosphere.

Of paramount signigicance to weather force are the constant and complex effects of radiative heating and cooling of air masses--processes originating in heat energy from the sun and thermal energy from the earth's surfaces.

Until recently, measuring such radiation effects was too costly and difficult to provide practical applications in weather forecasting. A single sampling of the atmosphere to measure thermal radiation conditions would have cost $25,000 or more and the limited information obtained would be almost meaningless.

Yet the need for better understanding of solar and thermal radiation in weather behavior has long been recognized--but it was necessary first to accumulate sufficient data for study and then to provide continuing data for application to weather forecasting. To accomplish this, radiation measuring instrument was required which was accurate, reliable, economical, simple and adaptable and which could then be put to extensive use.

In 1956, University of Wisconsin meteorologists Verner E. Suomi and Peter M. Kuhn (the latter working on his Ph. D.) developed an instrument which met all the requirements.

But as Dr. Kuhn, who is now the U.S. Weather Bureau's research meteorologist stationed at the University, points out it is one thing to develop a laboratory model and quite another to put it into engineering production.

This problem was taken to the Johnson Service Company, of Milwaukee, Wisconsin. Johnson Service, specializing in temperature control systems since 1885, was also the major producer of the radiosonde used by the U.S. armed forces during World War II and since then by the U.S. Weather Bureau.

-more-

Add two--meteorology

And the UW scientists hoped to attach their new radiometer to the radiosonde package as the most practical way to collect extensive radiation data.

Although the potential market for the new instrument appeared limited to research operations and would require a long time to amortize an R&D investment, Johnson Service agree to engineer production. (The fact that the company's Board Chairman, Joseph A. Cutler, was a UW engineering graduate and former President of the UW Alumni Association and that the company itself had long years of cooperative relationships with the University, were contributing factors).

"But even without our personal ties with the University, we felt that we should be involved in the development of this new heat measuring instrument which might have significance in our own field of air conditioning and heating systems," says Edward Jurasinski, Johnson's director of special products and controls.

"The only way we have been able to grow and remain competitive (Johnson now has 117 branch offices in the U.S., Canada, and 5 countries overseas, and operates manufacturing plants in Milwaukee, Dallas, Toronto, and Milan, Italy) is to keep up with technological research in our field and to take risks on promising developments. A certain amount of risk-taking is required in any kind of business," Jurasinski points out.

In this instance, the risk Johnson Service took was a substantial investment in engineering time required to work out critical tolerances and production techniques for the radiometer.

The Suomi-Kuhn Radiometer* as it was finally produced, consists of a cylindrical, molded foam-plastic box, shaped somewhat like a tambourine, two inches thick and twelve inches in diameter, with a flattened end projection for mounting purposes. The top and bottom are transparent plastic shields constructed like a thermopane window--with an insulating, sealed-air space between two (one-half mil thin) sheets

*Licensed through the Wisconsin Alumni Research Foundation

-more-

of polyethylene film. Behind each window is an absorber plate--a thin (one mil) aluminum sheet coated with a special flat-black paint developed by the Mautz Paint & Varnish Company, of Madison, to provide the most absorptive, non-reflective surface possible. This black plate is the target for the radiant (heat) energy of the electromagnetic spectrum ranging from a frequency of .0001 to .0040 centimeters (infra-red waves). Comparing this with man's ability to see: visible light ranges from .00005 to . 00007 centimeters.

Thermistors, or thermal resistors (high thermal gain ceramic element type) attached to the absorber plates translate the temperatures of the plates into electrical energy. The radiometer can detect a thermal change of ½ degree Fahrenheit--an energy equivalent of about 5 watts--at a range of 200 miles. Again comparing this to man, it would be like looking at a 100-watt bulb which is 200 miles away and noting an energy drop to 95 watts--assuming man could see the light at all.

Total weight of the radiometer is under 120 grams (about equal to the weight of four packs of cigarettes) which makes it ideal for balloon flight and satellite operations. Its low cost (under $30) makes it economically practical, even in non-recovery operations.

Attached to the radiosonde, the radiometer measures the heat energy encountered at various altitudes from two directions--that reflected and emitted from the earth and that coming from above. A clock mechanism in the radiosonde regulates the dual reading to be radioed back to the home station at each 500 feet of altitude.

First widespread experimental use of the Suomi-Kuhn radiometer was in a government-sponsored research project conducted by the University of Wisconsin in the Antarctic in 1959, which validated both the instrument and the significance of measuring radiation effects for weather information.

In October 1963, the beginning of the astronomical-meteorological important International Quiet Sun Year, the U.S. Weather Bureau began a two-year radiation

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add four--meteorology

study involving twice-a-week launchings of the radio-metersonde at 12 stations around the world (five are in the U.S.).

The Weather Bureau's Tiros satellites have also been carrying a similiar radiometer designed by Professor Suomi into outer space.

Results thus far have been promising--not only in confirming the significance of thermal radiation effects but also in revealing new radiative phenomena. For example, a small east-west thermal drive has been discovered to be operating in an area where the general north-south air cycle is losing its inherent drive characteristics and would be susceptible to relatively weak influences. This may account for sudden developments of certain weather patterns in the U.S.

Beginning last fall, the Weather Bureau is undertaking its first extensive program of radiation measurement. At 30 weather stations in the U.S. and another 30 throughout the world, radiometers are sent aloft with the regular twice-a-day radiosonde balloons to provide the first radiation network data for weather interpretation. Johnson Service Company is making the radiometers for this project.

Johnson recently received another order from the Canadian government which is also doing similar research in cooperation with U.S. research.

Although extensive use of the new radiometer in weather forecasting for macroclimate conditions is still in its initial stages, other UW research has indicated a potential for more localized applications.

Specific geographical, biological and man-made factors must often be considered in calculating local weather conditions--what the meteorologist calls the "microclimate" situation. An example of a geographical factor is the Great Lakes area where the water surface available tends to moderate temperature extremes to produce localized climatic conditions varying from the general area weather. Radiation measurements indicate a more precise method for calculating such local differences.

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Plants contribute to microclimatic differences through their utilization of water and their modification of wind. The distinction between forest cover and agricultural crops is readily apparent to the radiation meter and research has shown that even a row of trees used as a wind-break has microclimatic importance.

Radiation measurements show potential uses for many agricultural applications. They can provide advance warnings of localized crop-damaging weather conditions such as frost. A knowledge of the total "heat budget" requirements of specific crops, accompanied by daily measurements of the heat provided, constitutes a new way to determine precisely when a crop should be harvested for maximum maturity--important to food processing operations as well as to the food grower.

Tomorrow's farmers will undoubtedly utilize some form of radiation instrumentation, which is already practical on an individual farm basis. Aside from helping the farmer to know his local weather better--a radiometer can tell him when and exactly how much to irrigate--or tied in with automatic equipment, the radiometer can instruct the water pump to go on and off.

Microclimate variations between cities, suburbs and countryside are well recognized in local weather forecasting. These differences result from variations in reflecting surfaces--of streets, lawn and open fields and from the ability of buildings to modify wind. Such differentials influence local weather behavior and in terms of fog, wind and storm can be factors in a community's utility and transportation operations.

The expanding use of year-round air conditioning systems for industrial, office and apartment buildings, hospitals and laboratories presents another potential application for radiation instrumentation--uses which the Johnson Service Company is already exploring.

Present air conditioning systems generally operate with sensing devices located inside the building to maintain the desired climatic environment. Yet it is the outside weather which determines the load placed on the air conditioning system.

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Thus there is a lag time between outside and inside climatic changes. Radiation sensors located outside could provide a more sensitive method of anticipating weather changes which would eliminate the lag time and increase the efficiency of the air conditioning system. Such precise control of environmental climate is becoming increasingly important in a number of industrial processes and laboratory-like operations such as the "clean rooms" used in the fabrication of space-electronic gear.

The new radiometer's sensitivity to infra-red (heat) radiation, along with its low cost, suggest potential applications as a heat detector where over-heating of motors and machinery are problems. It could also be used for fire detection.

As Jurasinski assesses his company's experience with the new radiometer:

"We have already produced a highly successful instrument with an assured, expanding market in weather applications. And as a new kind of heat measuring device, it has opened up a whole spectrum of uses--not only in our principal business of climate control systems but also in applications which promise entirely new markets. The future of the radiometer is indeed "radiant'."

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U.W. NEWS

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON, WISCONSIN 53706

7/28/64 vh RELEASE: Immediately

MADISON, Wis.--Verner E. Suomi, University of Wisconsin professor of meteorology and widely known leader in the UW space research program, has been appointed chief scientist for the United States Weather Bureau, the University announced Tuesday.

The 49-year-old teacher and expert in studies of the atmosphere and its various phenomena related to heat, moisture, and wind, will take office the first week in September at Washington, D.C.

Prof. Suomi is the first person to be appointed to the new position with duties of advising the chief of the bureau and reviewing the content and adequacy of the Weather Bureau's scientific program. The position requires that it be filled for periods of one to two years by leading scientists from American universities and private industry.

Prof. Suomi will serve for one year, but will return to the Madison campus frequently to work with UW graduate students in meteorology.

He said UW space activities in meteorology will be continued in his absence under the direction of Prof. Robert Parent, who has been associated with the program since its beginning.

"None of our space activities could have occurred without the help of Professor Parent," Prof. Suomi stressed.

The new chief scientist of the nation's weather center received the Clarence LeRoy Meisinger Award from the American Meteorological Society in 1961 for his work in atmospheric radiation. He became widely known to the public as a Wisconsin scientist when the U.S. satellite program got underway in the late 1950s.

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Add one--Suomi

After two disappointing rocket failures, Explorer VII, carrying UW instruments to measure the earth's heat budget, was sent into orbit in October, 1959. The instruments, constituting one of seven experimental packages on board Explorer VII, were designed by a 12-man team under the leadership of Prof. Suomi.

The great importance of cloud systems in controlling the earth's heat loss was established by the data gained through Explorer VII. At the time of launching, Explorer VII was the largest of U.S. satellites.

Tiros III, launched in July, 1961, Tiros IV, in February, 1962, and Tiros VII, in June, 1963, lifted similar instruments into space and extended UW studies of the earth's heat budget.

Prof. Suomi joined the Wisconsin staff in 1948 as an assistant professor of meteorology. He was appointed associate professor in 1950 and full professor in 1958. The Eveleth, Minn., native received his Ph.D. degree in meteorology from the University of Chicago in 1953.

When he first came to Wisconsin one of his chief interests concerned moisture measurements in the stratosphere. He has worked also on water loss from soils, on water evaporation measurements and the question of how plants use their supplies of heat and water.

With UW meteorologist Dr. Reid Bryson he has studied deep-water lake currents. In 1955, with the U.S. Weather Bureau meteorologist Pete Kuhn, Prof. Suomi developed an improved and very economical instrument to measure radiation which has since been widely used. In 1956 he did a sonic anemometer study of turbulence near the ground and in 1957 a study of the plant climate of Wisconsin.

Begun by Suomi in 1953, a study of a cornfield's heat budget--how much sun energy the field absorbs and how much of the energy is reflected back into the atmosphere--was the beginning of the investigations which later were carried into space by the newly developing earth satellites.

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Add two--Suomi

The new chief scientist of America's Weather Bureau, who lives in Madison at 10 Rosewood Circle, is married to the former Paula Meyer, a teacher at Cherokee Junior High School, and is the father of two sons, Stephen and Eric, and a daughter Lois.

During the first quarter of 1962 he served with the National Science Foundation in Washington as associate program director for atmospheric sciences. He is at present a member of the panel on weather and climate modification sponsored by the National Academy of Sciences.

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U. W. NEWS

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

12/4/63 jb

RELEASE: Immediately

MADISON, Wis.--More than 100 young people representing 35 high schools in Wisconsin have registered for the third annual Junior Science Symposium to be held on the Madison campus of the University of Wisconsin this weekend.

Sessions will be held Thursday, Friday, and Saturday at the Wisconsin Center and Mechanical Engineering Building under sponsorship of the University, the U.S. Army Mathematics Research Center, and the U.S. Junior Science and Humanities Symposium program.

Two young scientists-to-be will present research papers: John D. Wasserstrass, Monroe, on "Indimetry: Inter-Dimensional Measure," and Barbara J. Hauck, Milwaukee Messmer, on "The 'in vitro' Effects of Growth Hormone on the RNA Content of Rat Liver."

Each high school is sending a member of its faculty to the meeting, and Robert E. Showers, Green Bay, and Ray Cook, Brookfield Central, will present research reports.

UW participants will include the following:

Profs. Robert C. Bless, speaking on "Astronomy from Above the Earth's Atmosphere"; Francis H. Henderson, "Active Areas in Hydrobiological Research"; Verner E. Suomi, "Meteorological Satellite--A Solution Looking for a Problem"; Aaron J. Ihde, "Patterns in Scientific Research"; C. Harvey Sorum, "Demonstrations in Chemistry"; William J. Drescher, "Unearthing the Secrets of Water";

James F. Crow, acting dean of the Medical School; Max W. Carbon, nuclear engineering; Milton O. Pella, science education; Kurt F. Wendt, dean of the College of Engineering; LeRoy E. Luberg, dean for public services; Robert A. Alberty, dean of the Graduate School; Jack R. Arndt, UW Extension; Wilson B. Thiede, associate dean of the School of Education; and Kenneth W. Dowling, Wisconsin High School.

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U. W. NEWS
FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

4/12/63 gr RELEASE: Tuesday, April 16

(ED. NOTE--This is the first article in a three-part series on major space research programs at the University of Wisconsin's Madison campus during Midwest Space Month, April 9-May 9.)

By GENE RODGERS

MADISON, Wis.--(Advance for Tuesday, April 16)--The most significant of findings beginning to come from the University of Wisconsin satellite research program is that generation of differences in temperature from east to west may be as important as north-south generations in determining weather, program director Verner E. Suomi announced recently.

It has been thought that the only major heat generating differences important to storm formation were those that occur as the temperature changes from pole to equator.

The UW meteorologists have discovered that high cloud covers trap heat beneath them, so that significant temperature differences may occur between covered and uncovered areas, regardless of their north-south orientation.

Ordinarily, storms occur when there is a displacement of air in a situation where large masses of air at different temperatures are side by side. This displacement may be caused when the north-south temperature difference exceeds a certain critical value.

But the same effect may be produced by the heat differences introduced and perpetuated by high cloud covers. By themselves these differences would not have enough energy to power a storm, but their upsetting effect may be like the match that starts things going, Prof. Suomi said.

The data on which these conclusions are based have been gathered by a series of balloon and satellite experiments. Profs. Suomi and Robert J. Parent, an electrical engineer, direct a team of researchers who have designed instruments for the satellites Explorer VII and Tiros III and IV.

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Add one--weather satellites

Another instrument package is planned for Tiros VII, which will be orbited in a few months.

Attention is being focused on efforts of the UW satellite group, as well as several other campus research departments, during the Midwest Space Month, April 9-May 9. The National Aeronautics and Space Administration sponsors much of the UW work.

According to Profs. Suomi and Parent, their satellite experiments are always essentially the same. The purpose of the series of launches begun in 1959 is to get more data and to get it over long time spans.

The instruments are designed to measure radiation arriving at the earth from the sun and reflected by the earth back into space. The difference between the two represents the radiation converted by the earth into the energy that powers its weather.

"We are trying to determine exactly how this energy drives the weather, using satellites to look down at the earth and back at the sun, and balloons to correlate conditions within the atmosphere," Prof. Suomi explained. "We are well satisfied with the data we are getting.

"Real progress will come in methods of interpreting the data to arrive at quantitative formulas, useful for mathematical models of the atmosphere, relating the earth's heat budget to its weather."

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WIRE NEWS

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

RELEASE:

4/26/63 js Immediately

MADISON--More than 200 educators from throughout Wisconsin are expected at the spring meeting of the Wisconsin Association of Secondary School Principals at the University of Wisconsin's Madison campus Monday and Tuesday (April 29-30).

Highlight of the meeting will be a Monday evening session with speakers from the National Aeronautics and Space Administration (NASA) in Washington, D.C. The public is invited to the session, which will be held at 7:30 p.m. in the auditorium of the Social Science Building.

Speakers will be Dr. Paul Gardner, NASA education specialist who will talk on "Implications of Space Exploration for Education," and Dr. Vincent Maturi, NASA scientist who will speak on "Industrial Applications of Space Age Technology."

Dr. Verner E. Suomi, University of Wisconsin scientist who has been a leader in developing instruments sent aloft aboard U.S. space satellites, also will speak at the session on "Peaceful Uses of Space."

The business and discussion meetings during the two-day conference will be held at the Wisconsin Center.

The conference is sponsored by the UW School of Education and the State Department of Public Instruction.

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U. W. NEWS

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

RELEASE:

2/21/63 gr Immediately

By GENE RODGERS

MADISON, Wis.--University of Wisconsin meteorologists and electrical engineers Thursday announced plans for a unique million dollar investigation of the lower atmosphere by microwave radio beams.

The announcement was made by UW researchers at a meeting on the campus with engineers from the Collins Radio Co. of Cedar Rapids, Iowa. The project is a joint effort by University scientists and the Collins firm, whose instrumentation research laid the groundwork for the program.

Very sharp microwave radio beams, about a degree wide, will be pulsed simultaneously from radar-like antennas 30 feet in diameter located at the Arlington Farms of the UW College of Agriculture and at Cedar Rapids. The beams will intersect midway between the two stations, about 140 miles apart.

Microwaves will scatter from the intersection, called the "common volume" of the beams. Part of the scattered radiation--about one ten-billionth of the total transmitted--will be picked up by the sensitive antennas in the pause between pulses. Transmission frequency and height of the "common volume" can be varied.

The characteristics of the scattered microwaves will be recorded and analyzed. They are related to atmospheric properties, in particular to moisture distribution, but also reflect thermal and turbulence phenomena.

-more-

Add one--microwave project

Principal UW investigators will be Verner E. Suomi, professor of meteorology, noted for his weather satellite experiments, and William P. Birkemeier, associate professor of electrical engineering. They met Thursday with G. R. Marner, director of research for Collins Radio, and D. M. Hodgin, assistant director.

The Collins program will be directed by G. T. Bergemann, director of the propagation research group, and their chief scientist will be I. H. Gerks.

The National Science Foundation last month granted UW the first part of an expected quarter-million dollars for the project. Collins Radio will provide additional equipment for the duration of the experiment valued at three-quarter million dollars. The Wisconsin Alumni Research Foundation has already expended $10,000 for preliminary work.

Operations are expected to begin when installation of equipment is completed in spring, and experiments will continue for almost two years.

"This method of probing the atmosphere electronically is a new idea conceived by Collins and UW researchers. It will provide basic meteorologic and electronic data which could ultimately have far-reaching practical applications," according to Prof. Suomi.

He mentioned the possibility that airports might in the future make use of such a set-up for continuous monitoring of flight conditions over their fields.

Prof. Birkemeier commented that "flicker" and "fadeout" of radio and TV signals might be avoided by automatically adjusting the transmitting frequency to suit atmospheric conditions in response to scattering information.

Both men stressed that these are far-in-advance speculations, and that their primary motivation is one of pure research. However, the practical achievements they mentioned cannot be accomplished without data such as they hope to provide, they added.

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U. W. NEWS FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

6/19/63 gr RELEASE: Immediately

MADISON, Wis.--University of Wisconsin meteorological instruments were aboard the Tiros VII weather satellite rocketed into orbit Wednesday.

The instrument package was designed by meteorology Prof. Verner E. Suomi and electrical engineering Prof. Robert J. Parent, who designed similar experiments for Explorer VII and Tiros III and IV. According to the scientists, the experiments are always essentially the same, but each successful launch gaining a new set of measurements "allows us to compare one year's global heat budget with another."

The purpose of the experiment is to measure radiation arriving at the earth from the sun and that reflected by the earth back into space. The difference between the two represents radiation converted by the earth into the energy that powers its weather.

The investigations are part of a research program which uses satellites to look down at the earth and up at the sun, and balloons to correlate conditions within the atmosphere. The goal of the program, begun in 1959, is to understand how heat energy drives the earth's weather.

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MADISON NEWS

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

4/23/63 js

Immediately

MADISON, Wis.--The impact of the space age on high school education in Wisconsin will be the focus of the 1963 spring conference of the Wisconsin Association of Secondary School Principals.

High school principals from throughout the state will attend the sessions at the University of Wisconsin's Madison campus Monday (April 29).

Two representatives of the National Aeronautics and Space Administration (NASA) in Washington and a noted UW scientist will speak at the general session of the conference in the auditorium of the Social Science Building at 7:30 p.m. The public is invited.

Dr. Paul Gardner, NASA education specialist, will speak on "Implications of Space Exploration for Education." Dr. Gardner's background includes work as a hsopital scientist, high school guidance counselor, and television weather analyst.

A NASA specialist in chemistry and life sciences, Dr. Vincent F. Maturi, will talk on "Industrial Applications of Space Technology." He spent 15 years as an industrial research chemist and was an administrator with the Food and Drug Administration before joining NASA.

Dr. Verner E. Suomi, University of Wisconsin professor of meterology and soils, will speak on "Peaceful Uses of Space." Prof. Suomi, a member of NASA's Space Science Board, has been a leader in developing heat measuring and other instruments sent aloft aboard U.S. space satellites.

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U. W. NEWS FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

2/8 /62 jl RELEASE: Immediately

(with satellite)

The University of Wisconsin recording devices that went aloft with the Tiros.IV payload of scientific instruments today are designed to measure the amount of energy from solar radiation that reaches the earth's outer atmosphere as well as the thermal radiation leaving the earth and its atmosphere. They also measure the amount of radiation that the earth reflects directly back to space.

The earth's efficiency as a reflector varies from hour to hour and day to day depending on the cloud cover--and the relationships between kinds of clouds and rate of flow of heat to and from the earth are among the things that the Wisconsin scientists are specifically interested in.

The information on the total incoming and outgoing radiation is basic information of great importance to meteorologists attempting to understand the broad-scale energy and weather patterns over the entire earth.

"We are not interested specifically in prediction," says Prof. Verner Suomi, leader of the Wisconsin satellite research team. "We are interested in learning the radiation or heat balance of the surface of the earth and the atmosphere so that eventually we will be able to figure out how it all works."

Once meteorologists have an understanding of the basic processes at work in the atmosphere, then immensely practical applications in forecasting should be forthcoming.

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The recording devices on Tiros IV are the same as those borne into space by the previous Tiros shots. Devices known as radiometers measure the earth's heat budget--the amount of energy received from the sun, and the amount reflected back. From this data, scientists can calculate the amount of energy involved in driving the earth's weather.

The earth loses more heat energy at the poles than at the equator, resulting in a giant and continual shift of energy from the equator to the poles. This continual flow of heat energy is one of the major generators behind the earth's climate and weather patterns.

The TV-record of cloud cover is extremely important to the Wisconsin scientists because clouds affect great variations in the amount of radiation reaching the earth from day to day. Prof.Suomi has said he believes that high clouds are the most important in the control of heat loss by the earth's surface.

"The higher clouds are, the colder they are," he points out. "It may seem strange, but the colder the cloud is, the more effective blanket it makes for keeping the heat in the atmosphere."

All but the first of the Tiros satellites carried TV cameras which have provided the meteorologists with detailed photographs of the cloud cover over large areas of the earth. By comparing the cloud photographs and the data obtained by the radiometers, it is possible to correlate cloudiness and radiation income for large areas of the earth.

While the Wisconsin meteorologists are interested primarily in the broad-scale measurements of total infra-red radiation, other experimental devices on the Tiros satellites are designed to measure narrow bands of the infra-red radiation, providing detailed information on the wavelengths most significant to the heat budget.

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The delicate instruments for the Wisconsin part of the Tiros payload were designed by Prof. Suomi and Robert J. Parent, an electronics expert, and constructed by Harry H. Miller, a project associate in engineering. The data obtained by the instruments is collected at the monitoring stations and shipped on magnetic tape to Madison for processing and analysis on computers.

The Tiros satellites are largely a National Aeronautics and Space Administration effort and most of the instruments aboard the satellite belong to the NASA. They include two TV cameras--one a standby in case the other fails to work--and the heat-sensing devices, plus telemetry equipment to radio the information obtained back to the earth.

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FEATURE STORY

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

10/30/61 rb

RELEASE: Immediately

By RICHARD BREWER

MADISON, Wis.--Two little circular discs of magnesium metal with miniature heat sensing devices called thermistors fastened to their backs are a vital part of the University of Wisconsin's contribution to the Tiros III weather satellite now in orbit around the earth.

Dr. Verner Suomi, the man in charge of Wisconsin's portion of the space satellite program, is already preparing a set of identical instruments for the next weather satellite.

The heat sensing instruments, called radiometers, were the heart of the last UW space effort in Explorer VII, the first U.S. weather satellite.

Radiometers provide information about heat loss from the earth's surface. The more information received about this daily change in the heat balance of the earth, the more accurate and complete a picture that can be constructed. Dr. Suomi wishes to understand just how heat is gained and lost through the presence or absence of cloud cover.

Information gained from the last satellite and now being borne out by the present satellite indicates that heat gain and loss due to cloud cover can be an important effect in forming our weather.

"There seems to be a large scale organization of cloudiness," Dr. Suomi pointed out in referring to how our weather is created.

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Add one--weather satellite

The Tiros III is largely a National Aeronautics and Space Administration effort and most of the instruments aboard the 200 pound, drum-shaped satellite belong to NASA. They include two TV cameras and some other heat sensing devices plus telemetry equipment for radioing back to earth the information gained from these devices.

The TV cameras, one a duplicate of the other to act as a standby in case of failure, provide information about cloud size, type, and from these, the wind direction.

Special information about the amount of heat lost at night or day in a specific area is provided by the other heat sensors on board. The instruments put on by Dr. Suomi are non-directional and give a general or summary picture of the earth's heat loss.

NASA is in charge of receiving the information and provides tapes of the correct data to Dr. Suomi for interpretation.

With three tapes already in, Dr. Suomi and his fellow scientists are getting results to add to their picture of the heat balance of the earth.

"I'm not interested in prediction; I'm more interested in just understanding how this works," commented Suomi when asked about the possible use of this data for weather predictions. Once the entire effect is well understood, Suomi stated, it and other information can then be used in predicting the weather.

Some of the effects that have already been noted include the fact that higher cloud cover allows less heat to escape than low cloud cover, and large, clear areas cool more rapidly than cloudy ones.

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U. W. NEWS

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

11/16/61 jb

RELEASE: Immediately

MADISON, Wis.--Dr. Verner E. Suomi, prominent University of Wisconsin satellite scientist, received a $5,000 grant from the U. S. Steel Foundation Thursday. The money will be used to improve the educational excellence of UW students in meteorology and to support Dr. Suomi's studies in atmospheric research.

R. O. Hawkanson, Duluth, Minn., vice president of U. S. Steel's Oliver iron mining division, made the presentation. It is to be offered to the UW Board of Regents for formal acceptance Friday.

Dr. Suomi is the leader of a University team providing instruments for the U.S. satellite program seeking quantitative and qualitative information on radiation balance between the sun and earth. He is a member of the committee on meteorological satellites on the Space Science Board of the National Aeronautical and Space Administration.

Born 46 years ago in Eveleth, Minn., Dr. Suomi earned degrees from Winona (Minn.) State College and the University of Chicago. He joined the UW faculty in 1948, becoming a full professor in 1958.

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U. W. NEWS

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

10/6/61 jb

RELEASE: Immediately

MADISON, Wis.--Conrad A. Elvehjem, president of the University of Wisconsin will be keynote speaker at the first statewide Junior Science Symposium on the Madison campus Nov. 2, 3 and 4.

One hundred and fifty pupils and their teachers representing 30 high schools have been invited to participate.

Seven of the young people will present papers. They are Robert Ginsky, LaCrosse Central; Sandra Hager, Milwaukee Lutheran; Thomas Klug and Michael Swanson, Superior Cathedral; Daniel Opitz, LaCrosse Aquinas; George Rossman, Eau Claire Regis; and John C. Schaefer, Sheboygan North.

UW faculty members invited to take active roles in the symposium include Prof. Marshall Clagett, of the Institute for Research in the Humanities; Prof. William B. Sarles, bacteriology; retiring Dean Mark H. Ingraham, College of Letters and Science; Dean Lindley J. Stiles, School of Education; Prof. Verner E. Suomi, meteorology and soils; and Prof. Robert J. Parent, electrical engineering.

Other participants are expected to be Jack Arndt, of the National Science Foundation high school program, and Col. George W. Taylor, Durham, N.C., commanding officer of the U.S. Army Research Office, which is assisting the symposium sponsor, the University, in supporting the program. A "curbstone clinic" will bring together faculty members from state colleges and Marquette University.

Teachers and officials asked to serve as observers and participants include:

Mary A. Doherty, Mary D. Bradford High School, Kenosha; Jerome H. Fisher, Milwaukee Nicolet; Lloyd Haville, Sparta; Sidney S. Jacobson, Waukesha Junior High; Sr. M. Evelyn, Milwaukee Messmer; Sr. M. Francis Xavier, Kenosha St. Joseph; Sr. M. Lauretta, Marshfield Columbus; Sr. M. Valerian, Eau Claire Regis; G. Camille Oliver,

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Milwaukee Washington; Charles W. Schribner, Appleton; Jerome Isaacs, Chetek; Bjorn Christensen, DePere;

Amos H. Yonke, Horace Mann Junior High, Wausau; Alfred Hornigold, Wisconsin Rapids; Robert Grogan, Milwaukee schools science supervisor; Dr. Roland C. Trytten, Wisconsin State College, Stevens Point; Dr. Harold Goder and Laverne Weidler, Wisconsin State College and Institute of Technology, Platteville; and Dr. Carl Welty, Beloit College, president of the Wisconsin Academy of Sciences, Arts and Letters.

In addition to schools listed above, selected for being most active in past years in this field, the following have been invited to send science teachers and pupils interested in science careers: Antigo, Marinette, Manitowoc, Janesville, Hayward, Rice Lake, Galesville-Ettrick, Monroe, Watertown, Medford and Shawano.

Registrants attending the sessions will also examine exhibits, tour science centers of the University and be entertained by ensembles and other groups from the UW School of Music.

Pres. Elvehjem is chairman of the advisory council of the Junior Science and Humanities Symposium.

Objectives of the meeting are to promote study of the sciences and mathematics, to demonstrate the role which humanities play in development of the scientist, to emphasize importance of both the sciences and humanities to national culture and welfare, to search out potentially talented youth and to assist them in developing their interest and abilities, to provide recognition and prestige in the school environment for pupils showing aptitude, and to further efforts to improve the prestige, preparation and recompense of science teachers.

Sessions will be held in the Wisconsin Union and Wisconsin Center, and pupils and teachers will be housed in UW short course dormitories.

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2/8/61 db

computer installation

MADISON, Wis.--Installation of the new million dollar electronic computer has been completed at the University of Wisconsin Numerical Analysis Laboratory, Preston Hammer, Laboratory director, announced Wednesday.

The machine, a Control Data Corportaion model 1604, is the largest electronic brain on any American University Campus. It is 100 times faster than the University's last machine, an IBM 650, and can remember 16 times as much information.

The computer can do as much work in 30 minutes as the past computer did in 24 hours.

Nearly every university department makes use of the Numerical Analysis's Laboratory's computers. Last year, about 300 major projects involving 400 faculty members and 700 studnets were undertaken on the IBM machine.

The great speed of the new machine will help match the growing demand for computer time and make possible solutions of problems to time consuming to be practical on the previous machine.

In the meterology department, Prof. Verni Suomi will use the CDC 1604 to study information received from his weather satellite.

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2/7/61/ db

computer installation

MADISON, Wis.--Installation of the University of Wisconsin's million dollar electronic computer--the largest owned by any American university--has been completed, it was announced Wednesday.

The announcement came from Preston Hammer, director of the UW Numerical Analysis Laboratory, where the machine is located.

~~An Control Data Corporation~~ The computer, a Control Data Corportaion model 1604, is 100 times faster than the University's last machine, an IBM 650.

~~The machine can do as much work in 30 minutes as the past~~
The new machine can do a day's work for the old computer
~~computer did in 24 hours~~
in 30 minutes.

Prof. Hammer estimates that nearly every university department will use the new computer. Last year, about 300 major projects involving 400 faculty members and 700 studnets were undertaken on the old machine, which was in operation 24 hours a day.

The machine was purchased to help match the growing demand for computer time and for solution to problems too time consuming to be practical on the previous machine.

U. W. NEWS

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

1/30/61 ml

RELEASE: Immediately

MADISON, Wis.--University of Wisconsin Meteorology Prof. Verner E. Suomi has won an American Meteorological Society Award given in memory of a young scientist who died while doing weather research.

Prof. Suomi was granted the Clarence LeRoy Meisinger Award. It was one of six given recently during the meteorological society's 41st annual meeting in New York.

The Wisconsin professor was cited for "imaginative and pioneering research work on atmospheric radiation problems in which he has effectively used both balloon and satellite observing platforms." Prof. Suomi is known for his leadership of the Wisconsin team that has designed experiments for satellites Explorer VII and Tiros II.

The Meisinger Award is given to honor a promising aeronautical meteorologist who died in 1924 at the age of 29. Dr. Meisinger was studying air motion from a free-flight balloon when it caught fire in a thunderstorm.

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U. W. NEWS FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

11/19/62 jl RELEASE: Immediately

MADISON, Wis.--A leading meteorologist has advocated establishing a global satellite weather-observing system.

Sverre Petterssen, speaking at a satellite meteorology conference held at the University of Wisconsin, said data obtained by weather satellites, along with data from weather stations and from balloon and rocket soundings, would greatly aid research leading to better basic understanding of the atmosphere, better predictive ability, and possibly eventual control over some weather events.

Practical advantages can be gained at once by developing an observation network in space, Petterssen added. Exploitation of these potentialities will result in "immediate and substantial improvements" in meteorological service, he said.

Petterssen is a member of the University of Chicago's Geophysics Institute and was one of a number of scientists attending a conference at Wisconsin last week concerned with satellite data now available to scientists for research.

"Recent studies by the World Meteorological Organization indicate that the maximum density of sounding stations needed for studies of the large-scale weather systems corresponds to a separation between stations of about 300 miles," he explained. "When seen against these minimal requirements, the existing network of sounding stations is grossly inadequate."

Most important phenomena to be studied, he said, are those related to atmospheric energy budgets, extent and character of cloud systems, earth-surface and cloud-surface temperatures. Global satellite coverage would also provide information on meteorological conditions needed in routine forecasting, such as position and movement of weather systems and storms and the temperature and height of clouds.

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Add one--satellite conference 11/19/62

Petterssen added that future developments hold promise of ability to delineate precipitation areas with the aid of satellite-borne radar and thunderstorm areas with the aid of sferics detectors and other remote-sensing devices.

Development of communication between satellites would permit monitoring of the entire satellite network simultaneously, to provide researchers with gradients and integrated values over large areas of the globe.

Verner Suomi of Wisconsin, who devised radiation-measuring instruments carried by the Explorer and Tiros series of satellites, reviewed radiation data now available for meteorological research.

The Suomi radiometer has obtained data on radiation in the 4 to 40 micron wavelength band which provides detailed information of great value in efforts to calculate accurately the heat budget of the earth--the energy input and output which is the basic driving force behind changes in atmospheric conditions.

Peter Kuhn, another member of the Wisconsin research team, said that balloon observations will continue to be useful as a check against data telemetered to earth from the satellites, and will assist scientists in determining what the satellites are capable of achieving in the way of accuracy and sensitivity.

William Nordberg of the National Aeronautics and Space Administration said research meteorologists will have data available in the next few months providing good photographic and meteorological coverage obtained during certain periods of 1961.

This information, to be made generally available to researchers throughout the country, was obtained during orbits over the United States, Europe, and Australia.

There is also complete coverage of the globe for a single day, and a record of infra-red radiation "tracking" of Hurricane Anna by satellite. The data from Tiros Four has not yet been processed into form for general use.

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U. W. NEWS

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

RELEASE:

11/23/60 ml Immediately

MADISON, Wis.--Scientific information from the new television weather satellite that was pushed into space from Cape Canaveral, Fla., today, will soon be coming into the University of Wisconsin.

Meteorology Prof. Verner E. Suomi said he and a team of University researchers will be processing and analyzing information sent back from space by Tiros II in an effort to learn more about world weather.

Prof. Suomi expects that scientific data from several ground receiving stations will be checked and go through preliminary processing by Washington scientists of the National Aeronautics and Space Administration, which developed and built Tiros II (second Television Infra-Red Observation Satellite).

Although no instruments in the satellite could be labeled "Made in Wisconsin"--as was the case with the Explorer VII satellite and may be the case with future weather satellites--one experiment aboard Tiros II was designed at UW and the scientific information from this experiment will be sent here for analysis.

In about a month the University should be receiving partially processed satellite information from Washington, Prof. Suomi said. He expects it will come as photographs of earth's cloud cover, temperature figures to be translated into radiation measurements, and perhaps a few spools of tape carrying satellite information.

Two weeks of analysis of this information should give Wisconsin meteorologists the first clues to the weather questions they are asking with the satellite.

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The basic question is: "What kind of clouds control the flow of heat and sunlight from the earth?"

Prof. Suomi said: "Explorer VII (launched Oct. 13, 1959 with a UW heat budget study as one of seven experiments aboard) has clearly shown cloudiness controls the earth's heat loss. But Explorer VII was blind to the kinds of clouds below it. With the cameras of Tiros II, now we can see what kinds of clouds impose this control on the heat loss."

"I think," said Prof. Suomi, "that high clouds control the heat loss. The higher clouds are, the colder they are. It may seem strange, but the colder the cloud is, the more effective blanket it makes for keeping the heat in the atmosphere."

The job of processing, analyzing and checking the information will be handled by a UW team of some 7 persons, including Prof. Suomi, Prof. Robert J. Parent, director of the Electrical Standards Lab; Fred House, Gordon Tucker and Col. Melvin Weinstein in meteorology; with the U.S. Weather Bureau's Resident Meteorologist Peter Kuhn and graduate student Bob Bushnell checking satellite measurements by balloon releases from the ground as the satellite passes overhead.

Explorer VII's transmitters were expected to shut down Oct. 13, but were still broadcasting recently. Measurements from Explorer VII were in good agreement with both balloon releases and pictures taken by the previous television satellite. Tiros I. This satellite sent back about 16,000 pictures with meteorological information before its effective life ended in July.

Tiros II, basically the same as Tiros I, is expected to tell more about the clouds because of its ability to separate heat measurements from light measurements. Like Tiros I, its effective scientific life will be about three months.

Tiros II, like Tiros I, has a wide-angle camera and a narrower angle camera. In addition, Tiros II has two radiation instruments.

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The first is a scanning type of infra-red instrument capable of giving a coarse television picture which can not distinguish cloud areas smaller than 30 miles square. In other words, the resolution of the instrument is 30 miles.

Scanning at a number of wavelengths, this instrument will give five radiation measurements--infra-red radiation by day; long-wave radiation by day and night; stratosphere temperatures in the earth's band of water-vapor; a "look through the atmospheric window" between clouds to earth's surface, ignoring the water-vapor band, and finally, a total measurement using other measurements in combination, to fill in measurement gaps.

Most important to the UW researchers is Tiros II's other radiation instrument, which consists of two non-scanning satellite sensors. These will look at the same area as the television cameras and will measure heat lost from earth and heat plus sunlight reflected from earth. By subtraction, the UW researchers can find out how much sunlight is reflected through the clouds.

"These measurements will not be detailed, but will be average values," said Prof. Suomi. "It's a very simple experiment," he said.

Because the earth's heat budget--how much sun energy earth keeps and how much it loses--is different for various parts of the world, there are shifts of energy within the atmosphere. These shifts are a basic cause of world weather.

Heat budget differences can be partially explained because dark jungle and ocean areas at the equator absorb more sun energy than the vast reflecting fields of the polar regions.

But clouds, which act like greenhouse glass over sections of earth for a time, and then shift to other areas, also create patterns of differences in the heat budget. What Prof. Suomi and the UW researchers learn from Tiros II should enable a new and exciting look at the big picture of world weather.

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U. W. NEWS FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

7/12/61 jfn

RELEASE: Immediately

MADISON, Wis.--University of Wisconsin scientists contributed one of the experiments aboard the Tiros III weather satellite which the United States fired into orbit from Cape Canaveral, Fla., Wednesday morning, it was reported by Prof. Verner E. Suomi of the meteorology department.

The UW instruments are designed to extend the Wisconsin satellite study of the earth's heat budget, which began with Explorer VII in October, 1959. Explorer VII is still in orbit and sending signals.

Prof. R. J. Parent, electrical engineering, reported by telephone from Cape Canaveral to Prof. Suomi that the Wisconsin equipment seems to be "working fine." Suomi monitored signals from Tiros III as it made its first orbit over the United States at about 7:15 a.m. on receiving equipment at the University's Pine Bluff Observatory.

The new satellite promises expanded scientific weather measurements over Explorer VII that should be a big boost for the Wisconsin study. "We won't be operating in the blind anymore," Suomi commented.

He explained that NASA instrumentation aboard Tiros III stores data for one complete orbit around the globe and discharges the information on its path over the U.S.

"We can get data from Explorer VII only when someone is monitoring. That means a number of gaps because of places where its signal is inaccessible," Suomi said.

-more-

In addition, television cameras aboard Tiros III will provide scientists with pictures of storms, clouds, and other weather conditions.

"I feel very good about this new satellite. It promises to be of major assistance to our study," Suomi said.

The delicate Wisconsin instruments for Tiros III were designed by Prof. Parent, an electronics expert, and constructed by Harry H. Miller, project associate in electrical engineering. Herman Weidenbeck built the sensors for the Wisconsin experiment.

Wisconsin data from the satellite will be collected by monitoring stations of NASA on the east and west coasts. The data will be shipped on magnetic tape to Madison for analysis by Suomi and his team on UW computers.

The heat budget experiment measures the amount of sunlight earth receives, the amount reflected back, and the heat energy which the earth absorbs and holds for a time, then gives back to the atmosphere.

The earth loses more heat energy at the poles than at the equator, Suomi explained, resulting in a giant shift of energy from equator to poles. This is a basic cause of world weather.

Suomi commented that "sweating out" the satellite firing from Madison is "worse" than being on the spot at Cape Canaveral, where he witnessed the Explorer VII shot.

"It's tougher when you're this far away and don't know what is going on. Oddly enough, in both cases we got our first word of the firing on an auto radio."

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Suomi

BOXSCORE ON UW SATELLITES

Vanguard experiment flopped into the Atlantic

First Explorer VII burned on pad at Canaveral

1 — EXPLORER VII went into orbit in October, 1959

Tiros II, orbited in November 1960, had instrumentation which grew out of UW team's experiments but was NOT made by UW

2 — TIROS III was orbited in July, 1961

3 — TIROS IV was orbited in February (8), 1962

U. W. NEWS

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

7/26/60 ml RELEASE: Thursday, July 28

By MACK LAING

HELSINKI, Finland--(Advance for Thursday, July 28)--University of Wisconsin Prof. Verner E. Suomi told a world meeting of scientists here Thursday what a UW-designed satellite experiment has been telling about world weather.

He said the nine-month-old Explorer VII was giving a broad-scale weather pattern. He said satellite measurements of earth's heat loss were in excellent agreement with measurements made simultaneously on UW balloon test flights.

Prof. Suomi spoke at the International Union of Geodesy and Geophysics, a scientific meeting held once every three years for scientists who study the earth's shape, size, surface, and graviety, and forces that affect the earth.

It was the first time a European audience had heard the results of Wisconsin's heat budget experiment, one of seven experiments carried in Explorer VII. The stubby, 91½-pound satellite was carried into orbit last Oct. 13 in a Juno II rocket launched from Cape Canaveral, Fla.

Prof. Suomi said not only was good comparison possible with upper air studies at 18,000 feet, and with surface analysis, but also, in some instances, it was possible to relate the satellite measurements with television pictures of cloud cover taken by the newest weather satellite, Tiros I.

The most surprising outcome, Prof. Suomi said, was that in a chosen series of results transmitted by Explorer VII last April, the earth lost more heat than researchers expected. The UW meteorologist cautioned this might be only a "momentary departure" from estimates, and more satellite information would have to be studied.

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Since the launching on Oct. 13, the satellite has traveled about 100,000,000 miles and circuited earth more than 4,000 times--once every 101 minutes. Fifteen listening posts around the world are recording temperature information broadcast from the satellite's two transmitters. The team at UW is trying to make sense from this mass of information.

The heat budget experiment measures the amount of sunlight earth receives, the amount reflected back, and the heat energy which the earth absorbs and holds for a time, then gives back to the atmosphere. So far only the satellite results for the last type of energy--long-wave, infra-red radiation--have been analyzed by the UW researchers.

The earth loses more heat energy at the poles than at the equator, Suomi explained, resulting in a giant shift of energy from equator to poles. This is a basic cause of world weather. Explorer VII measurements are now telling weathermen how big the shift is at various spots in various seasons.

Prof. Suomi presented his audience with two examples--case studies of what the satellite is measuring. He selected a series of results from late November and early December as typical of a winter situation in measurement, and an April series of results as typical of spring. A series of experimental results for summer is now being developed and an autumn series will be started in September. Prof. Suomi said only long-wave radiation was considered in these examples because the information on such radiation could be processed faster.

The Wisconsin meteorology professor pointed out the unexpected heat loss shown in the April series of results--a 10 per cent departure from average estimates. If the loss continues, he said, the earth will either have to get more energy from the sun, to make up for the loss, or begin to cool off. He stressed that more study of the satellite's continuing information for all seasons will have to be done before attempting to answer this new question Explorer VII has posed. He estimated it would take six to 12 months to analyze all the measurements after the satellite outlives its usefulness in October and transmitters go silent.

-more-

Add two--Suomi in Finland

"Very clearly and as we expected, weather controls heat loss," Prof. Suomi said.

Where there are clear, cloudless, high-pressure areas, he said, the satellite shows there is a lot of heat loss. Traveling over low-pressure areas--such as storms--the satellite transmitted low heat loss measurements. Prof. Suomi called this "a surprisingly accurate correlation," indicating satellite measurements could be used as a weather predictor, useful in detection of storms in places where there are no weather observers.

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9/24/59

WHEREAS, on October 13, 1959, an earth satellite containing instruments designed and constructed at the University of Wisconsin, was successfully launched and achieved an orbit, and:

WHEREAS, the information now being received from this heat budget experiment is expected to increase our knowledge of weather, and:

WHEREAS, the work of this University's satellite team of scientists, who persisted to success despite earlier disappointments, has brought distinction to this University through this investigation of the fringes of space,

THEREFORE, BE IT RESOLVED THAT: the Board of Regents of the University of Wisconsin extend its congratulations and sincerest wishes for further success to the scientists who made this experiment possible: Meteorology Prof. Verner E. Suomi; Prof. Robert J. Parent, director of the Electrical Standards and Instrumentation Laboratories; Prof. Wayne B. Swift, electrical engineering; project associates Harry Miller and Peter Schoffer; instrument makers Andrew Grondahl, Ernfred J. Romare and William A. Hauser; Meteorology graduate students Charles R. Stearns and Stig A. Rossby, former mechanician Eugene H. Schraut, and graduate student Carroll Frenzel.

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U. W. NEWS FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

RELEASE:

10/13/59 eda

MADISON, Wis.--The man who heads the University of Wisconsin scientific team which designed and built instruments to perform the "heat budget" experiment is 44-year-old Meteorology Prof. Verner E. Suomi.

He is a native of Eveleth, Minn., and received his undergraduate engineering training in his home state at Winona State Teachers College.

Suomi received his Ph.D. in 1953 from the University of Chicago. Before this he was a public school teacher, instructor in meteorology at Chicago (1943-45), director of the instrument laboratory (1945-47), and beginning in 1948, meteorology professor at Wisconsin.

The weather satellite is taking a "big look" at a problem which Suomi has studied for some time on a much smaller scale.

Suomi's Ph.D. thesis project was to determine the heat budget of a cornfield A heat budget, like any budget, is an accounting of what comes in and goes out--in this case, amounts of thermal radiation reaching the earth, and leaving it.

The cornfield problem was an extremely practical one. As Suomi puts it, "The amount of moisture that stays in the soil depends on how much 'heat of evaporation' remains there. The money a farmer puts in the bank is moisture. Moisture lost by evaporation is money lost."

The weather satellite's job is to determine the heat budget of the whole earth, not just a single cornfield, Suomi says. This is one of the greatest needs for the present in meteorological research, he adds.

For Suomi, moving into space hasn't meant abandoning the cornfield, however, With agrometeorologist Dr. David Wang, he is authoring five pamphlets on Wisconsin's agricultural climate for use by farmers and growers.

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And he has taken part in lake research with Prof. Reid A. Bryson, meteorology department chairman, measuring currents in deep water, water evaporation, and how plants use their supplies of heat and water.

Putting together the instrument packages for Vanguard III and Juno Satellit has been more than a one-man job. Prof. Suomi drew on the know-how of a number of University departments, including his fellow meteorologists, electrical engineers, and solar energy specialists.

He went first to the College of Engineering with an idea and a tentative design. The engineers took over from there, and "made it work," Suomi says.

Members of the team which helped him are:

Prof. Robert J. Parent, electrical engineering, specialist in electronics and communication and director of the UW Electrical Standards and Instrumentation Laboratories (ESIL);

Prof. Wayne B. Swift, electrical engineering, consultant to the ESIL and winner of the 1958 Kiekhofer Memorial Teaching Award;

Charles R. Stearns, project associate, meteorology, who handled development and calibration of the balls mounted on the satellite's surface which register the intensity of thermal radiation;

Harry H. Miller, project associate, meteorology and ESIL who did much of the construction work on the delicate inner workings of the satellite's instrument package;

Peter Schoffer, project associate, engineering; instruments makers, Ernfred J. Romare, William A. Hauser, and Andrew Grondahl, all of the College of Engineering general shop; Eugene H. Schraut, former technician ESIL; and meteorology department graduate assistants Stig A. Rossby and Carroll Frenzel.

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U. W. NEWS

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

7/16/59 eda

RELEASE:

MADISON Wis.---Wisconsin can justly feel quite an attachment to "Payload 16."

An exciting experiment on the cause of weather performed by a University-built system of meteorological instruments is one of six scientific investigations included in the 91½-pound payload.

And the University's Pine Bluff Observatory, 13 miles west of Madison, is a link in the globe-girdling network of specially instrumented stations equipped to "listen in" on messages from the satellite.

At Pine Bluff an antenna is picking satellite signals out of the air, and relaying them to the basement of the Observatory for recording on magnetic tape, the form in which they will be processed.

UW "listeners" at Pine Bluff are tuned in on two tone frequencies--560 and 730 cycles per second--assigned to the University's part of the experiment. (The pitch above middle C is 440 cycles per second and A an octave above is 880).

Each of the six experiments transmits its data to earth through the use of audible tones carried by a 20 megacycle signal.

Electronically Wisconsin's contribution to the instrument package differs little from the set of instruments in the ill-fated Vanguard III fired June 22 from Cape Canaveral.

That satellite, which failed to achieve orbit when the third stage of its rocket did not function properly, was completely instrumented at Wisconsin.

Vanguard carried a tiny tape recorder with a six-foot length of tape on which measurements of three heat radiations were to be stored.

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In response to interrogations from 13 receiving stations spotted around the world, the tape recorder would have played back its message of measurements which were coded as numbers from 1 to 1,000.

Payload 16 is rigged to transmit its messages continuously, hence there is no need for a storage unit such as the tape recorder.

It transmits the same kind of coded signal as Vanguard would have, and "manufactures" information at the same speed--once every six seconds.

Payload 16's transmitter, powered by a solar battery, operates at 20 megacycles compared with 108 megacycles for Vanguard.

It was Russia which demonstrated with Sputnik I that a signal at this low frequency was received much better than anyone previously had expected.

The lower frequency signal carries farther just as lower frequency television stations--low channel numbers-- have a greater effective range than higher frequency stations.

This means that fewer receiving stations are needed to pick up signals. In theory, Wisconsin engineers say, four stations spotted on the equator would be able to maintain continuous contact with the satellite.

Because the satellite can transmit and be heard continuously, there's no need to store information and to signal for its release by interrogation while the satellite is over a receiving station.

Elimination of the tape recorder simplifies the instrument package, a distinct advantage.

There are two disadvantages, however. The first is that the listening operation must be continuous. For Vanguard it would have been limited to two or three 15 second periods a day when the satellite's path was within the range of the receiving station.

A second difference between Payload 16 and Vanguard III is the location and the number of "sensors," tiny silver spheres about the size of ping-pong balls which detect heat radiation.

Vanguard III had four projecting antennas with a sensor at the tip of each.

--more--

Payload 16 has six sensors spotted on the satellite's surface. Two of them measure the intensity of direct sunlight, and two others the sunlight reflected from earth, particularly from cloud cover and snow. The third pair measures heat rays of longer wave length radiated into space from the earth and atmosphere.

Sensors which measure the same type of radiation are located on opposite sides of the satellite so that at no time are both in the satellite's own shadow and measurements disrupted.

Some sensors are actually hemispheres mounted on reflecting mirrors, a neat trick which makes the sensor look like a complete sphere to incoming radiation and makes the absorption of radiation much easier to calculate.

The sensors themselves are coated and shielded so that each "looks at" only one of the three kinds of radiation.

The amount of radiation striking the sensors controls their temperature. Inside each is a thermistor, an electric thermometer no bigger than a speck of dust.

The temperature of the thermistor, in turn, controls its resistance. That is, it controls the amount of electric current that can pass through a thermistor cemented at the junction of silver wires which stretch across the inside of each sensor.

Silver wire is a good conductor of heat, and so the wires serve to average the surface temperature of the sensor along their length.

The material of the thermistor is metal oxides. Resistance of this material to the flow of electricity varies with temperature--the higher the temperature, the lower the resistance.

Varying amounts of electric current which are allowed to pass through the thermistor operate a "pulse" generator. The pulses, in turn, feed into an electronic counter in the heart of the satellite, where they are changed into coded signals to be transmitted.

The processing center for these coded signals, received at stations around the globe similar to the one at Pine Bluff, will be the University meteorology department.

Data from all receiving stations will come here in the form of magnetic tape records.

For processing, the data will be fed into the IBM 704 electronic computer at the Midwestern Universities Research Association laboratory on University Avenue in Madison.

This machine is busy during the day working out the orbits of atomic particles in MURA's proposed giant atom smasher. Now, during the evening, it will translate space data into a picture of the earth's thermal radiation balance--what meteorologists call a "heat budget."

From the study of satellite records it is hoped that much more can be learned about what makes the weather and how it changes. Presently very little is known.

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U. W. NEWS FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

6/28/60 ml RELEASE: Immediately

MADISON, Wis.--Twenty-nine University of Wisconsin scientists have been chosen to participate in the preparation of a giant reference work.

The big job is the McGraw-Hill Encyclopedia of Science and Technology. When it's published this fall in 15 volumes, it will be the largest encyclopedia of its kind ever produced. More than 2,000 specialists working for the past two years have prepared 7,200 articles covering these broad fields of knowledge.

The choice of UW participants by the encyclopedia staff is a tribute, since only nationally and internationally known authorities with reputations for clear writing were selected to take part.

Faculty members were chosen from 16 UW departments. Each article will be initialed by its author and all contributors will be cited in the encyclopedia with their affiliations.

UW Prof. Farrington Daniels, emeritus professor of chemistry, was picked to be one of the encyclopedia's 62 consulting editors, giving articles the final check for timeliness, completeness and clarity.

These are the other UW specialists contributing to the 9,300-page reference work: from bacteriolgoy, Prof. Oscar N. Allen and Assoc. Prof. Harlyn O. Halverson; from chemistry, Profs. Paul Bender and Edwin M. Larsen, and Assoc. Prof. Lawrence F. Dahl; from Theoretical Chemistry Lab, Project Director Joseph O. Hirschfelder and Assoc. Prof. C.F. Curtiss.

From botany, Profs. John T. Curtis and Kenneth B. Raper; from geography, Prof. Arthur H. Robinson and Assoc. Prof. Edwin H. Hammond; from geology, Emer. Asst. Pro Frederick T. Thwaites and Prof. Robert F. Black; from meteorology, Profs. Verner E. Suomi and Heinz H. Lettau and Asst. Prof. Robert A. Ragotzkie; from psychology, Prof.

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Karl U. Smith, Assoc. Prof. E. James Archer and Visiting Prof. Clifford T. Morgan.

Nine other UW departments provided one contributor each: W. Robert Marshall, Jr., associate dean, College of Engineering; Prof. R. H. Bing, chairman, mathematics department; Prof. James F. Crow, chairman, medical genetics; Prof. Hjalmar D. Bruhn, agricultural engineering; Prof. Raymond G. Herb, physics; Assoc. Prof. S. Morris Kupchan, pharmaceutical chemistry; Prof. Harland W. Mossman, anatomy department; Prof. Hans Ris, zoology; and Prof. Gerald Thorne, plant pathology and zoology.

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MADISON NEWS

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

RELEASE:

7/5/60 ns

Immediately

MADISON--Prof. Lyle W. Shannon, University of Wisconsin department of sociology, delivered a major paper at the Center for Agricultural and Economic Adjustment, Iowa State University, Ames, on June 27.

The paper, "Goals and Values in Agricultural Policy and Acceptable Rates of Change," will be published by the Iowa State University Press following the conference.

#0-

Prof. Verner Suomi of the UW meteorology and soils departments flew to Los Angeles recently to attend a meeting of the Committee on Meteorological Aspects of Satellites. The meeting was held in conjunction with a meeting of the Space Science Board, June 26-27.

##

WIRE NEWS

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

7/13/60 ml

RELEASE: Immediately

MADISON, Wis.--Two University of Wisconsin scientists will leave Madison in mid-July to attend an important scientific meeting in Finland as specially invited delegates from the United States government.

Dr. Heinz H. Lettau, professor of meteorology and civil engineering, and Dr. Verner E. Suomi, professor of soils and meteorology, will attend the International Union of Geodesy and Geophysics meeting in Helsinki. Hundreds of scientists gather for the meeting which is held once every three years.

Dr. Lettau will tell of his research on dissipation of atmospheric energy near the ground. Dr. Suomi will speak to a European audience for the first time on Wisconsin's part in the measurement of the earth's heat budget by means of satellites.

The Wisconsin scientists' research is related, being part of the large question of how the earth's atmosphere uses energy it receives from the sun.

##

WIRE NEWS FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

1/5/61 RELEASE: Immediately

MADISON--One hundred and five students and three faculty members will be initiated into membership in the University of Wisconsin chapter of Phi Kappa Phi, national scholastic honor society, at the annual initiation ceremony at 3 p.m. Sunday, Jan. 8, in Great Hall of the Memorial Union, it was announced on the UW campus today.

Faculty members honored are Prof. Charles Heidelberger, oncology; Prof. May S. Reynolds, home economics; and Prof. Verner E. Suomi, meteorology and soils.

A reception-tea for new members and their parents will follow the ceremony.

Of the 105 students elected to the society, 64 are seniors and 41 are juniors. Election to the society is on the basis of scholarship, extra-curricular activities, and faculty recommendations as to character, leadership, and general good citizenship.

Students elected are:

SENIORS: Ann E. Addington, Kenilworth, Ill.; Janis K. Babler, 802 11th Ave., Monroe; Herbert A. Beali, Appleton; Carolyn J. Benkert, Monroe; Virginia F. Benner, Janesville; Roberta G. Bohnen, Hinsdale, Ill.; Michael A. Brunner, Leopolis; Joann M. Zastrow, Wausau; Georgia Dennis, Wauwatosa; John N. Drye, Oregon; Jeanette Dudley, Racine; Charles H. Engel, Brillion; Lois A. Engelman, Tomahawk; Ronald G. Faich (2219 N. 15th St.), Milwaukee; Marilyn A. Fink, Green Bay;

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U. W. NEWS FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

RELEASE:

7/16/59 eda

MADISON, Wis.--The satellite borne aloft by Juno II has been in preparation since Russia fired Sputnik I. It is this nation's biggest and most complex scientific satellite to date.

Instruments for six experiments, among them the "heat budget" investigation conceived by University of Wisconsin scientists, are included in the 91½-pound space vehicle.

The Army Ballistic Missile Agency (ABMA), headed by German-born Wernher von Braun, planned the "package" as a follow-up to International Geophysical Year experiments carried on under Project Vanguard.

Several of the experiments included were instrumented separately for Vanguard launchings. The package contains some of these which were re-engineered by their authors and Army scientists to fit into the single package of six experiments.

The payload was assembled at the Army's Redstone Arsenal in Huntsville, Ala. It goes by one of two names--"IGY Backup" or "Payload 16."

Two X-ray experiments, an investigation of three levels of cosmic ray intensity, a geiger tube for measuring atomic radiation, an experiment in micro-meteorite erosion of space vehicles, and the heat budget experiment devised by UW meteorology Prof. Verner E. Suomi are included.

Like the earlier Wisconsin-instrumented Vanguard III which failed to achieve an orbit, "Payload 16" has a set of instruments built at the University which is sensitive to differences in the earth's thermal radiation balance.

Three kinds of thermal radiation are being measured:

(1) the intensity of direct sunlight;

-more-

add one--satellite background

(2) sunlight reflected from earth, particularly from cloud cover and snow; and

(3) terrestrial radiation--heat rays of longer wave length which are sent into space by earth and the atmosphere.

After a giant mathematical calculation by electronic computer, processed measurements of the three radiations will yield a series of quantities in what meteorology department scientists call the earth's heat budget.

A heat budget, like any budget, is an accounting of what comes in and what goes out, in this case, heat reaching the earth from space and leaving it.

Direct sunlight, the earth's source of heat, is balanced over a long period in this budget by the amount of reflected sunlight and heat radiated from the earth and the atmosphere.

If this were not a fact, the earth would get hotter and hotter.

The same kind of logic is used to pin down the basic nature of the atmosphere's system of circulation. It is known that the atmosphere transfers heat from the tropic areas to the polar areas, since the tropics, which receive more heat from the sun than the poles, would get hotter if such a transfer did not take place.

And polar regions, which radiate much more heat into space than they receive from the sun, would continually get colder.

This transfer of heat is our weather. And the driving force causing the transfer is whatever imbalance exists in the heat budget--a surplus coming in or going out at some point in the cycle of atmospheric circulation.

For this reason, measurement of the thermal radiation quantities which cause it is an important though little-developed key to understanding what makes weather.

Earth satellites roving far outside the earth's atmosphere offer what Prof. Suomi calls "an ideal platform for measuring the earth's thermal radiation balance."

-more-

add two--satellite background

By computing the heat budget, University meteorologists hope to learn more about the way heat drives the "giant" machine which is the atmosphere.

Fuel for this machine is the constant flow of heat energy from the sun.

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U. W. NEWS FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

RELEASE:

10/13/59 eda

MADISON, Wis.--The man who heads the University of Wisconsin scientific team which designed and built instruments to perform the "heat budget" experiment is 44-year-old Meteorology Prof. Verner E. Suomi.

He is a native of Eveleth, Minn., and received his undergraduate engineering training in his home state at Winona State Teachers College.

Suomi received his Ph.D. in 1953 from the University of Chicago. Before this he was a public school teacher, instructor in meteorology at Chicago (1943-45), director of the instrument laboratory (1945-47), and beginning in 1948, meteorology professor at Wisconsin.

The weather satellite is taking a "big look" at a problem which Suomi has studied for some time on a much smaller scale.

Suomi's Ph.D. thesis project was to determine the heat budget of a cornfield. A heat budget, like any budget, is an accounting of what comes in and goes out--in this case, amounts of thermal radiation reaching the earth, and leaving it.

The cornfield problem was an extremely practical one. As Suomi puts it, "The amount of moisture that stays in the soil depends on how much 'heat of evaporation' remains there. The money a farmer puts in the bank is moisture. Moisture lost by evaporation is money lost."

The weather satellite's job is to determine the heat budget of the whole earth, not just a single cornfield, Suomi says. This is one of the greatest needs for the present in meteorological research, he adds.

For Suomi, moving into space hasn't meant abandoning the cornfield, however, With agrometeorologist Dr. David Wang, he is authoring five pamphlets on Wisconsin's agricultural climate for use by farmers and growers.

-more-

And he has taken part in lake research with Prof. Reid A. Bryson, meteorology department chairman, measuring currents in deep water, water evaporation, and how plants use their supplies of heat and water.

Putting together the instrument packages for Vanguard III and Juno Satellit has been more than a one-man job. Prof. Suomi drew on the know-how of a number of University departments, including his fellow meteorologists, electrical engineers, and solar energy specialists.

He went first to the College of Engineering with an idea and a tentative design. The engineers took over from there, and "made it work," Suomi says.

Members of the team which helped him are:

Prof. Robert J. Parent, electrical engineering, specialist in electronics and communication and director of the UW Electrical Standards and Instrumentation Laboratories (ESIL);

Prof. Wayne B. Swift, electrical engineering, consultant to the ESIL and winner of the 1958 Kiekhofer Memorial Teaching Award;

Charles R. Stearns, project associate, meteorology, who handled development and calibration of the balls mounted on the satellite's surface which register the intensity of thermal radiation;

Harry H. Miller, project associate, meteorology and ESIL who did much of the construction work on the delicate inner workings of the satellite's instrument package;

Peter Schoffer, project associate, engineering; instruments makers, Ernfred J. Romare, William A. Hauser, and Andrew Grondahl, all of the College of Engineering general shop; Eugene H. Schraut, former technician ESIL; and meteorology department graduate assistants Stig A. Rossby and Carroll Frenzel.

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[Suomi, Prof Verner E.

U. W. NEWS

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

6/22/59 eda RELEASE: Immediately

MADISON, Wis.--Rocket performance was something less than 100 per cent in the launching of Vanguard III, the University of Wisconsin-instrumented satellite, and it failed to achieve a stable orbit, the National Aeronautics and Space Administration told UW meteorologists early Monday evening.

Vanguard's failure cost the University satellite team one opportunity to perform an exciting experiment on the cause of weather.

The shiny 20-inch, 22½-pound sphere carried a "package" of meteorological instruments developed by Prof. Verner E. Suomi.

But neither the experiment nor the University's chance to participate in space science is completely lost as a result of this failure.

The Wisconsin satellite team headed by Suomi has built a nearly identical instrument package--called "Payload 16"--which is scheduled for launching shortly by an Army Jupiter rocket.

Like Vanguard III, Payload 16 is sensitive to differences in the earth's thermal radiation.

Had Vanguard achieved a stable orbit its job would have been to record round-the-world variations in three kinds of thermal radiation:

(1) the intensity of direct sunlight;

(2) sunlight reflected from earth, particularly from cloud cover and snow; and

(3) terrestrial radiation--heat rays of longer wave length which are sent into space by earth and the atmosphere.

In combination, these three heat radiations determine the earth's heat

-more-

add one--Satellite flop

budget, which like any budget, is an accounting of what comes in and what goes out.

Sunlight falling directly on the earth is balanced, in general, by the amount of reflected sunlight--particularly from clouds and snow--and the heat which radiates from the earth and the atmosphere.

If this were not true, the earth would get hotter and hotter, Suomi explains

By the same kind of logic, it is known that the atmosphere transfers heat from the tropical areas to the polar areas, since the tropics, which receive more heat from the sun than the poles, would get hotter if such a transfer did not take pl

And polar regions, which radiate much more heat into space than they receive by solar radiation, would grow continually colder.

This transfer of heat is the weather we experience. And the driving force behind the transfer is whatever inbalance exists in the heat budget--a surplus coming in or going out at some point in the atmospheric system of circulation.

Because the transfer is our weather, measurement of thermal radiation is an important, though little-developed, key to weather forecasting.

By computing the heat budget, University meteorologists hope to pin down the way in which the atmosphere transfers heat. And by so doing, they may provide important new clues for successful long-range weather forecasting.

Earth satellites roving far outside the earth's atmosphere offer what Prof. Suomi calls "an ideal platform for measuring the radiation balance of the earth."

###

Turner

FILE

October 10, 1961

Dear Dr. Turner,

Early in September I called your office and, unfortunately, you were out of the country at that time, but I did have a very pleasant talk with your administrative assistant.

The reason for my call was to ascertain the status of the grant that Professor Verner E. Suomi of our Meteorology Department was to have received last spring. Your administrative assistant checked with your Pittsburgh office and informed me that everything was satisfactory and that Professor Suomi should be receiving his grant from your Aid to Science program shortly after Labor Day. To my knowledge nothing has come through our office and I am wondering if there is anything further we need to do in order to receive these funds.

I am enclosing copies of two letters which may help you to recall the circumstances behind this purposed grant. Thank you for your consideration in this matter.

Sincerely,

George R. Field
Assistant to the President

Dr. W. Homer Turner
Executive Director
United States Steel Foundation
71 Broadway
New York 6, New York

Enclosures (2)

UNIVERSITY OF WISCONSIN
Madison 6

Department of Meteorology

May 3, 1961

President Conrad Elvehjem
158 Bascom Hall

Dear President Elvehjem:

Please express to the United States Steel Foundation my and the Department of Meteorology's thanks and appreciation for the generous grant they have given. Its value to us is much more than its actual monetary worth because of its indication of confidence and because of the possibility of great flexibility in its use. The latter is a most important point which we will try to preserve.

This flexibility can be put to good use toward improving the students' educational excellence. At the risk of sounding miscellaneous let me illustrate with a few examples.

1. Improvement in continuity. Although many of our graduate students receive grants-in-aid from a number of sources it is a vexing fact that the time a semester begins and the time the grant-in-aid is available is rarely the same. It is a rare student who chooses the area of study on its interest and excitement alone. He tends to lean toward the one where the grant-in-aid is already available and is usually reluctant to take the professor's word that support will be available. The U.S. Steel grant would be extremely helpful for filling in these gaps and guaranteeing much needed continuity.

2. We would like to award a modest prize such as the cost of travel and expenses to a National Meeting of the American Meteorological Society or American Geophysical Union, to one or two students each semester (if there are any so deserving) as an award for his demonstration of excellence in grasp of a subject. This should not be for course work alone but be judged on a somewhat more comprehensive scale.

3. Undergraduate students. On rare occasions a really capable undergraduate student shows up. There is no present arrangement where he can obtain needed laboratory supplies or equipment so that he can do some modest research. A student's curiosity doesn't turn on like a faucet when he reaches graduate school. To such a student the possibility of being in a laboratory is like having food.

4. Special Symposia. It is probably best to bring a symposium to the campus and to the students. This is not always possible. An alternate is to bring the student to the symposium if the subject matter and his maturity warrant it. A modest expenditure which will allow his attendance at an appropriate symposium can provide an educational experience not possible for a classroom.

I have tried to describe a few of the ways ~~how~~ we would attempt to assist a student's scientific education. We would be careful to use the funds in a manner that cannot be done with those received from the usual sources. Admittedly it is an experiment--and like experiments it can succeed or fail--however we will never know unless we try.

Sincerely,

/S/ Verner E. Suomi

Verner E. Suomi

VES:sb

May 5, 1961

Dear Dr. Turner,

In response to a call a few days ago regarding a grant to Professor Suomi, I am enclosing a letter which he prepared. I believe this summarizes the plans that Professor Suomi has for this very fine grant.

May I express my personal appreciation for this award and I am sure Professor Suomi will find it very worthwhile.

Sincerely yours,

C. A. Elvehjem
President

Dr. W. Homer Turner
Executive Director
United States Steel Foundation
71 Broadway
New York 6, New York

Enclosure (1)

Robert O. Hawkanson
VP of U.S. Steel's Oliver
Iron mining div. Duluth,

FACULTY INFORMATION SHEET
University News Service
The University of Wisconsin

DATE OF FILLING IN FORM Feb 19, 1958

NAME Verner E. Suomi

POSITION (academic rank, department, date of appointment, etc.) Ass't Prof 1948
Assoc Prof. of Meteorology 1951

PREVIOUS POSITIONS YOU HAVE HELD (please give status, institution, dates)
Director of Instrument Laboratory Dept of Meteorology Univ of Chicago 1945-47

EDUCATION (please give dates of degrees granted or dates of attendance)

Undergraduate college Winona Teachers College 1938 B.E.

Graduate college University of Chicago 1953 Ph.D.

SPECIAL FIELD(S) OF STUDY OR RESEARCH (give dates of completion of any major projects)
1948 moisture measurement in stratosphere
1953 Heat budget of a Cornfield.
1954 Improved net Radiometer
1956 Sonic anemometer stdy of turbulence near the ground.
1957-8 IGY Earth Satellite No 4
1957 Phyto climate of Wisconsin

IF YOU HAVE A FAVORITE PHOTOGRAPH OF YOURSELF, PLEASE ATTACH A GLOSSY PRINT, OR INDICATE WHERE WE CAN SECURE ONE. ? — Mon. newspapers — Possibly — State Journal

Marie - Please fill in

PUBICATIONS (books and articles with dates)

HONORS AND/OR AWARDS YOU HAVE RECEIVED (dates) K Δ P Honor Society as Undergrad

HONORARY FRATERNITIES, PROFESSIONAL SOCIETIES, CLUBS TO WHICH YOU BELONG (list dates of offices held) K Δ Π, Purple Key, Σ X, American Meteorological Society, American Geophysical Union,

Associate Editor Journal of Meteorology

DATE AND PLACE OF BIRTH Eveleth, Minn Dec 6, 1915

IF MARRIED, GIVE WIFE'S MAIDEN NAME, DATE OF MARRIAGE, AND NAMES AND BIRTH DATES OF CHILDREN Paula Meyer Aug. 10, 1941

Lois Sept 27, 1943; Stephen: Dec 16, 1945;

~~Stephen~~ Eric June 24, 1950

IN ADDITION TO THE ABOVE "WHO'S WHO" TYPE INFORMATION, WE WOULD APPRECIATE A FEW INFORMAL NOTES ON THE CLASSES YOU TEACH, YOUR HOBBIES, YOUR SERVICE OR WAR WORK, YOUR PUBLIC SERVICE, ETC. Theoretical Meteorology, Instruments,

Ag meteorology - Micrometeorology

(Please use reverse side of these pages for additional information.)

file

United States Steel Corporation

Wolvin Building
Duluth 2, Minnesota

GEORGE C. ZELLER
DISTRICT DIRECTOR
ALFRED W. WILSON
ASSISTANT DISTRICT DIRECTOR

PUBLIC RELATIONS
LAKE SUPERIOR DISTRICT
RANDOLPH 2-8383

USS

November 27, 1961

Mr. Jack Burke
University of Wisconsin News Service
Observatory Hill
Madison 6, Wisconsin

Dear Jack:

It was very pleasant to visit with you about publicizing the presentation of our Foundation's check to Dr. Suomi. We are collecting clippings and, as I promised, will shoot them down to you.

As you might suspect, we had somewhat of a wild ride back. We got out by plane, but only after several promises of takeoff, then always becoming later. We were two hours late arriving in Duluth where the same sort of weather as we left in Madison awaited us.

Best wishes to you. Please give me a call if you're ever up our way.

Sincerely,

George

George C. Zeller

U. W. NEWS FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

RELEASE:

10/13/59 eda

MADISON, Wis.--Wisconsin can justly feel quite an attachment to the "Juno satellite."

An exciting experiment on the cause of weather performed by a University-built system of meteorological instruments is one of six scientific investigations included in the 91½-pound payload.

And the University's Pine Bluff Observatory, 13 miles west of Madison, is a link in the globe-girdling network of specially instrumented stations equipped to "listen in" on messages from the satellite.

At Pine Bluff an antenna is picking satellite signals out of the air, and relaying them to the basement of the Observatory for recording on magnetic tape, the form in which they will be processed.

UW "listeners" at Pine Bluff are tuned in on two tone frequencies--560 and 730 cycles per second--assigned to the University's part of the experiment.

Each of the six experiments transmits its data to earth through the use of audible tones carried by a 20 megacycle signal.

Electronically Wisconsin's contribution to the instrument package is identical with the set of instruments in the ill-fated Vanguard III fired June 22 from Cape Canaveral.

That satellite, which failed to achieve orbit when the third stage of its rocket did not function properly, was completely instrumented at Wisconsin. The second attempt on July 16 with Payload 16, also failed.

Vanguard carried a tiny tape recorder with a six-foot length of tape on which measurements of three heat radiations were to be stored.

-more-

In response to interrogations from 13 receiving stations spotted around the world, the tape recorder would have played back its message of measurements which were coded as numbers from 1 to 1,000.

The Juno satellite is rigged to transmit its messages continuously, hence there is no need for a storage unit such as the tape recorder.

It transmits the same kind of coded signal as Vanguard would have, and "manufactures" information at the same speed--once every six seconds.

The satellite transmitter, powered by a solar battery, operates at 20 megacycles compared with 108 megacycles for Vanguard.

It was Russia which demonstrated with Sputnik I that a signal at this low frequency was received much better than anyone previously had expected.

The lower frequency signal carries farther just as lower frequency television stations--low channel numbers--have a greater effective range than higher frequency stations.

This means that fewer receiving stations are needed to pick up signals. In theory, Wisconsin engineers say, four stations spotted on the equator would be able to maintain continuous contact with the satellite.

Because the satellite can transmit and be heard continuously, there's no need to store information and to signal for its release by interrogation while the satellite is over a receiving station.

Elimination of the tape recorder simplifies the instrument package, a distinct advantage.

There are two disadvantages, however. The first is that the listening operation must be continuous. For Vanguard it would have been limited to two or three 15 second periods a day when the satellite's path was within the range of the receiving station.

A second difference between the Juno satellite and Vanguard III is the location and the number of "sensors," tiny silver spheres about the size of pine-pong balls which detect heat radiation.

-more-

Vanguard III had four projecting antennas with a sensor at the tip of each.

Juno has six sensors spotted on the satellite's surface. Two of them measure the intensity of direct sunlight, and two others the sunlight reflected from earth, particularly from cloud cover and snow. The third pair measures heat rays of longer wave length radiated into space from the earth and atmosphere.

Sensors which measure the same type of radiation are located on opposite sides of the satellite so that at no time are both in the satellite's own shadow and measurements disrupted.

Some sensors are actually hemispheres mounted on reflecting mirrors, a neat trick which makes the sensor look like a complete sphere to incoming radiation and makes the absorption of radiation much easier to calculate.

The sensors themselves are coated and shielded so that each "looks at" only one of the three kinds of radiation.

The amount of radiation striking the sensors controls their temperature. Inside each is a thermistor, an electric thermometer no bigger than a speck of dust.

The temperature of the thermistor , in turn, controls the thermistor's electrical resistance. That is, the temperature of the thermistor controls the amount of electric current that can pass through the thermistor. The thermistor is cemented at the junction of silver wires which stretch across the inside of each sensor.

Silver wire is a good conductor of heat, and so the wires serve to average the surface temperature of the sensor along their length.

The material of the thermistor is metal oxides. Resistance of this material to the flow of electricity varies with temperature--the higher the temperature, the lower the resistance.

Varying amounts of electric current which are allowed to pass through the thermistor operate a "pulse" generator. The pulses, in turn, feed into an electronic counter in the heart of the satellite, where they are changed into coded signals to be transmitted.

Data from all receiving stations will come here in the form of magnetic tape records.

For processing, the data will be fed into the IBM 704 electronic computer at the Midwestern Universities Research Association laboratory on University Avenue in Madison.

This machine is busy during the day working out the orbits of atomic particles in MURA's proposed giant atom smasher. Now, during the evening, it will translate space data into a picture of the earth's thermal radiation balance--what meteorologists call a "heat budget."

From the study of satellite records it is hoped that much more can be learned about what makes the weather and how it changes. Presently very little is known.

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WIRE NEWS

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

RELEASE:

7/16/59 eda Immediately

MADISON, Wis.--Instruments for six experiments, one of them the "heat budget" investigation conceived by University of Wisconsin scientists, were included in the 91½-pound satellite payload which failed Thursday when an Army Juno II rocket exploded.

The satellite had been in preparation since Russia launched Sputnik I. It was this nation's biggest and most complex scientific satellite to date.

Two X-ray experiments, an investigation of three levels of cosmic ray intensity, a geiger tube for measuring atomic radiation, an experiment in micro-meteorite erosion of space vehicles, and the heat budget experiment devised by UW meteorology Prof. Verner E. Suomi were included.

Like the earlier Wisconsin-instrumented Vanguard III, whose rocket also failed, the Army payload had a set of instruments built at the University which was sensitive to three kinds of heat radiation: direct sunlight, sunlight reflected from the earth, and heat rays of longer wavelength radiated into space from the earth and the atmosphere.

Prof. Suomi and Prof. Robert J. Parent, electrical engineering, witnessed the failure at Cape Canaveral.

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7/21/58
mcg

Add one - Travelers

Rudolf Kolisch of the Pro Arte quartet who is lecturing on interpretation at the Festival of New Music in Darmstadt, Germany, after taking part in the Chamber Music Festival in Jerusalem; Albert Rahier of the quartet, who is headquartered in Brussels while he attends European music festivals; Prof. Dale E. Wurster of pharmacy who is attending the Conference of Pharmacy sponsored by the Romanian Ministry of Health and Welfare in Bucharest;

Dr. Joshua Lederberg of medical genetics who will take part in the Phage meeting in Royaument, France, and the International Congress of Microbiology at Stockholm before he returns to this continent for the International Congress of Genetics in Montreal; Drs. Harold P. Rusch, Van Potter, G. A. LePage, and Charles Heidelberger, oncology, who are attending the meeting in London of the International Union Against Cancer;

Profs. Carl Baumann, Paul J. Kaesberg, and Robert L. Baldwin, biochemistry, and Prof. Folke Skooge, botany, who will attend the International Congress of Biochemistry in Vienna Sept. 1-7; (Baldwin will remain in Europe to do research in protein chemistry at Londerstron-Lang laboratories in Copenhagen); Prof. Dean O. Staley, meteorology, who will attend the London meeting of the Royal Meteorological Society to read the paper prepared by himself and Profs. V. E. Suomi and Peter M. Kuhn;

Profs. Rudolph E. Langer, Laurence Young, and Morris Marden, mathematics, who will be UW delegates, Prof. Stephen Kleene, who will be the delegate for the Association of Symbolic Logic and read a paper, and Prof. Preston C. Hammer, Numerical Research laboratory, for the International Congress of Mathematics in Edinburgh; Prof. Gaines Post, history, who will attend the meeting of the Institute for Research and Study of Canon Law at the University of Louvain and the meeting of the International Commission for the History of Assemblies in Brussels;

Prof. J. F. Stauffer, botany, who will visit the Nova Pharmaceutical laboratories in Copenhagen and attend the International Microbiological Congress at Stockholm; Prof. Walter Plaut, botany, who will visit the biological laboratory in

more

File [Suomi, Verner, biog]

See [Research -
Satellite]

for Prof. Suomi's part in this project. "Pix" file also contains a folder marked [Research-Satellite]

3/2/59

Also see folder for:
[International Geophysical Year]
for the three stories written by Ralph Clark 7/2/57 in which Prof. Suomi and his research work on the satellite are included.

U. W. NEWS FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

10/23/58 eda RELEASE: Immediately

MADISON, Wis.--The second research report in a series of five on the agricultural climate of Wisconsin by University of Wisconsin meteorologists Jen Yu Wang and Verner E. Suomi was released recently by the Agricultural Experiment Station.

The report, titled "Temperature: Normals and Hazards," was preceded by "The Growing Season." The three remaining publications will deal successively with moisture, light, and phenology.

These graphical and statistical summaries of the climate in Wisconsin are based on observations for extended periods at over 240 stations scattered around the state, and are made available for use of Wisconsin farmers and growers.

Meteorological factors such as soil temperature which the weather bureau has never recorded are included in the second report, Since soil temperature is highly variable from place to place and present soil temperature data exists for only a few places, a technique has been devised for estimating soil temperature at any given depth.

Known as the controlled line and controlled point system, this scheme of graphical analysis based solely on maximum and minimum daily air temperatures.

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U. W. NEWS FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

6/17/58 rt RELEASE: June 17, 1958

UW BUDGET SUMMARY 1958-59

MADISON, Wis.--University of Wisconsin regents approved 1958-59 budgets Tuesday totaling $47,437,435 for University operations and $5,427,880 for University Hospitals.

The University budget will maintain current operating levels, provide salary increases averaging 2 per cent for the faculty and give civil service employes their legal step increases and cost-of-living bonuses. It is $3,077,377 higher than the current University budget.

The increase includes Legislative appropriations of $654,652 to pay for the salary increases and bonuses, $1,920,000 in research and services supported by contracts, gifts, grants and extension receipts anticipated on the basis of current agreements, and $500,000 in additional receipts from auxiliary enterprises, mainly athletics and the expanded Residence Halls.

Of the University's budget, state appropriations and federal land grant funds will provide about one half of the funds during 1958-59. The remainder is expected to come from gifts, grants, contracts, and operational receipts.

The total University Hospitals budget will be supported by receipts for services including $1,858,305 from the state and the counties of Wisconsin for care of welfare cases and veterans.

The University's expenditures budgeted for 1958-59 include $19,078,955 for instruction, $1,820,900 for student services, $12,445,183 for research, $7,680,232 for auxiliary educational and business enterprises, and $40,000 will be held in

-more-

a president's unassigned fund for contingencies. The budget anticipates that the University will save $358,028 during the year because of leaves of absence, deaths, resignations, and similar causes.

Sources for University funds for the year include $21,340,455 from state tax appropriations, $2,160,055 from federal Land Grant appropriations, $15,886,925 from receipts and savings, and $8,050,000 from gifts and grants.

Faculty salary increases in the 1958-59 budget will raise the average salaries paid professors for the academic year from $9,976 to $10,053, associate professors from $7,511 to $7,590, assistant professors from $6,104 to $6,153, and instructors $5,029 to $5,080.

A total of 592 faculty members received raises ranging up to $250 for the year, 577 received raises of from $251 to $500, 37 from $501 to $750, and 13 received raises for the year greater than $750.

A total of 814--including most of the top administrators and highest paid professors--received no increase this year. University officials pointed out that the limited salary increase funds available were used mainly to reward the most promising younger faculty members and to adjust inequities.

The 13 who received the largest increases are Prof. Fred H. Harrington, history, $1,750, who will become vice president of academic affairs when the budget year opens July 1, and Prof. John E. Willard, chemistry, $2,456, who will become dean of the Graduate School at the same time.

Others are Profs. William H. Stone, genetics, $1,500; Dallas V. Clatanoff, medicine, $1,000; H. L. Ahlgren, agriculture, $900; H. Edwin Young, economics, $850; Robert M. Benjamin, physiology, $800; Charles Heidelberger, oncology, $840; and Deral D. Teteak, athletics, $775.

Those on the academic year include Profs. R.H. Bing, mathematics, $1,000; Verner E. Suomi, meteorology and soils, $1,000; R. C. Buck, mathematics, $790; and Joshua Chover, mathematics, $760.

-more-

The 1958-59 budget is based on an enrollment estimate of 16,460 on the Madison campus, 5,000 at the University of Wisconsin-Milwaukee, and 1,505 in the Extension Centers, a total of 22,965 students, 541 more than the present enrollment.

Total direct and indirect cost-per-student for instruction on the Madison campus is expected to increase from the present $860 to $875. If the cost for student services is added to the total instruction cost, direct and indirect, the increase is from $918 to $934 on the Madison campus. Comparable increases are anticipated for the Summer Session and at the University of Wisconsin-Milwaukee, but a slight decrease in the costs at the Extension Centers is expected.

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U. W. NEWS FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

RELEASE:

10/13/59 eda

MADISON, Wis.--The Juno satellite that went up today has been in preparation since Russia fired Sputnik I. It is this nation's biggest and most complex scientific satellite to date.

Instruments for six experiments, among them the "heat budget" investigation conceived by University of Wisconsin scientists, are included in the 91½-pound space vehicle.

The Army Ballistic Missile Agency (ABMA), headed by German-born Wernher von Braun, planned the "package" as a follow-up to International Geophysical Year experiments carried on under Project Vanguard.

Several of the experiments included were instrumented separately for Vanguard launchings. The package contains some of these which were re-engineered by their authors and Army scientists to fit into the single package of six experiments

The payload was assembled at the Army's Redstone Arsenal in Huntsville, Ala. It goes by one of two names--"IGY Backup" or the Juno satellite.

Two X-ray experiments, an investigation of three levels of cosmic ray intensity, a geiger tube for measuring atomic radiation, an experiment in micro-meteorite erosion of space vehicles, and the heat budget experiment devised by UW meteorology Prof. Verner E. Suomi are included.

Like the two earlier Wisconsin-instrumented satellites which failed to achieve orbit, this one has a set of instruments built at the University which is sensitive to differences in the earth's thermal radiation balance.

Three kinds of thermal radiation are being measured:

(1) the intensity of direct sunlight;

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U. W. NEWS

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

RELEASE:

5/5/58/ cas 635 Immediately

MADISON, Wis.--Alton L. Blakeslee, top science reporter of the Associated Press, will be one of four speakers at the editorial seminar of the 1958 Journalism Institutes, May 16 and 17, at the University of Wisconsin.

The annual conference of newspapermen will focus this year on "Journalism in the Satellite Age". The editorial seminar, one of four separate sessions, is designed to brief editors on advances in space science.

Blakeslee will discuss problems of reporting news of scientific developments. One of his most recent assignments for the AP was a series on the controversy over effects of radioactive fallout.

Blakeslee has been on the AP staff since 1939. His father was the news service's first science writer. Blakeslee began specializing in science reporting after World War II. He covered Admiral Byrd's Antarctic expedition in 1946-47 and has since won several awards for outstanding science reporting.

Other speakers who will appear on the editorial seminar program with Blakeslee include Brig. Gen. Austin W. Betts of the Office of the Director of Guided Missiles, Washington, D.C., and Prof. Verner Suomi of the University of Wisconsin department of meteorology.

The Journalism Institutes also will include seminars for circulation and advertising managers of newspapers.

The conference is sponsored by the University of Wisconsin School of Journalism, Extension department of journalism, department of agricultural journalism, and the School of Commerce.

U. W. NEWS FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

4/9/58 rt

RELEASE: Immediately

WISCONSIN CENTER DEDICATION PROGRAM AT A GLANCE
April 11, 1958

DEDICATION, Wisconsin Center Auditorium, 9:30 a.m.
Invocation....The Rt. Rev. Msgr. Edward M. Kinney
Master of Ceremonies....Frank V. Birch, President, UW Foundation
For the Foundation....Howard I. Potter, Chairman of the Board
For the Regents....Wilbur N. Renk, President
For the University...E.B. Fred, President
Soloist....Bettina Bjorksten
Benediction....The Rev. John R. Collins

WISCONSIN CENTER FORUM, Auditorium, 10 a.m., Pres. E. B. Fred, presiding
Section I Moderator....Dean Mark H. Ingraham
"Chemistry and World Energy Needs"....Prof. Farrington Daniels
"Engineering the Future"....Prof. W. Robert Marshall
Section II Moderator....Dean John Z. Bowers
"New Horizons in Cancer Research"....Prof. Van R. Potter
"Serving Agriculture Through Education"....Prof. Henry L. Ahlgren

UNVEILING OF THE PLAQUES, Wisconsin Center Lobby, 12 noon.
Tributes....Pres. E. B. Fred

LUNCHEON, Great Hall, Memorial Union, 12:15 p.m.
Presiding....Provost J. Martin Klotsche
"War and Peace--1958"....Prof. Michael B. Petrovich

WISCONSIN CENTER FORUM, Auditorium, 2:30 p.m., Vice Pres. I.L.Baldwin, presiding.
Section I Moderator....Prof. Helen C. White
"A New Golden Age for Social Studies at Wisconsin?"...Prof. Merle Curti
"Business and the University--a Two Way Street"...Prof. W. Donald Knight
Section II Moderator....Director Henry J. Duwe
"Satellites and Meteorology"....Prof. Verner E. Suomi
"Law and Society"....Prof. Willard Hurst

DINNER, Great Hall, Memorial Union, 7 p.m.
Toastmaster....Frank V. Birch
Remarks: Vernon W. Thomson, Governor of Wisconsin
Conrad A. Elvehjem, University President-Elect
Herbert V. Kohler, Chairman, Foundation Centennial Fund
Address....Earl D. Johnson, Executive Vice President, General Dynamics

University Carilloneur Ralph C. Ehlert will present a concert at 5 p.m.
Exhibits will be on view throughout the day in the Wisconsin Center.

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U. W. NEWS

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

RELEASE:

4/30/58 rf Immediately

MADISON, Wis.--Hundreds of engineers, trained at the University of Wisconsin and now practicing their profession in Wisconsin and many other states, will join with UW faculty, students, and friends in celebrating Wisconsin's 10th annual Engineers' Day this Friday (May 2).

The visiting engineers and industrialists will inspect the University's engineering campus, its new buildings, research laboratories, and projects, and will hear special lectures on satellites and their meaning for the future.

After touring the many research projects now under way under Wisconsin's Engineering Experiement Station program, they will attend a dinner in the Memorial Union Great Hall at 6:30 p.m., Friday, at which five men, widely known in science, engineering, transportation, and industry, will be honored.

Not only the engineers but their ladies as well will have a part in the celebration. From 3 to 5 p.m. Friday, a reception and social hour for visiting engineers and members of the UW engineering faculty and their wives will be held in the student lounge of the University's Electrical-Mechanics Engineering Building adjoining Camp Randall.

At the special lectures session on "Satellites for Science" at 1:30 p.m. in 2033 of the Electrical-Mechanics Engineering Building, four UW faculty members will be speakers: Prof. A. E. Whitford, chairman of the UW astronomy department, talking on "Sane Thinking on Satellites;" Prof. J. O. Hirschfelder, department of chemistry, and director of the UW Naval Research Laboratory, on "Satellites Open Our Eyes;" and Profs. Verner E. Suomi, meteorology and soils departments, and Wayne

-more-

B. Swift, electrical engineering, on "Wisconsin's Part in the Satellite Program." The public is invited to the special lectures session.

Distinguished service citations for outstanding accomplishments in their fields will be presented at the dinner to Howard Aiken, professor of applied mathematics and director of the Computation Laboratory at Harvard University, a 1923 UW graduate; Harry C. Brockel, municipal port director for Milwaukee; George H. Johnson, president of the Gisholt Machine Co., Madison; William B. Murphy, president of the Campbell Soup Co., Camden, N.J., a 1928 UW graduate; and Arthur F. Peterson, vice president of Bethlehem Steel Co., Bethlehem, Pa., a 1918 UW graduate.

Conrad A. Elvehjem, president-elect of the University, will give the main address at the dinner, speaking on the subject, "Scientists and Engineers." The annual Benjamin Smith Reynolds Award of $1,000 for excellence in the teaching of future engineers will be presented to a UW faculty member by Regent Pres. Wilbur N. Renk of Sun Prairie. Prof. Philip C. Rosenthal, chairman of the UW College of Engineering's department of mining and metallurgy, will preside, and music will be provided by the UW A Cappella Choir under the direction of Prof. J. Russell Paxton of the School of Music.

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WIRE NEWS FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

3/20/58 jfn RELEASE: Immediately

MADISON--University of Wisconsin Meteorologist Verner E. Suomi will show the Wisconsin satellite and discuss Vanguard I on the first edition of "Campus Journal" Monday at 7 p.m. on WHA-TV.

The new weekly program, prepared by TV News students in the School of Journalism, will also present films and photographs of campus events. Jack Newman, class instructor, will narrate the program.

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U. W. NEWS FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

3/13/58 rt RELEASE: Immediately

MADISON, Wis.--The executive vice president of General Dynamics Corp., Earl D. Johnson, New York, will be the principal speaker at the dedication-day dinner marking the opening of the Wisconsin Center building for adult education on the University of Wisconsin campus.

The University today announced the program for the dedication and the Wisconsin Center Forum which will follow the brief ceremony. The dedication is scheduled to begin at 9:30 a.m. April 11, the Wisconsin Center Forum at 10 a.m.

The day-long forum, on subjects ranging from law to satellites, will feature some of the University's own distinguished authorities in many fields. Johnson's speech will be the highlight of a dinner which will close the day. He is an alumnus of the University and former undersecretary of the Army.

Toastmaster for the dinner will be Frank V. Birch, Milwaukee, president of the University of Wisconsin Foundation which is presenting the $2,400,000 building to the University, a gift of alumni and friends of the institution.

Faculty members who will take part in the Forum will include:

Prof. Farrington Daniels, pioneer in atomic and solar energy and one of the University's most honored scientists;

Prof. W. Robert Marshall, associate dean of the UW College of Engineering and director of Wisconsin's broad engineering research program;

Prof. Merle Curti, the University's Frederick Jackson Turner Professor of History and winner of the Pulitzer prize for his book, "The Growth of American Thought";

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Prof. W. Donald Knight, University business research expert and financial assistant to Gov. Vernon W. Thomson;

Prof. Van R. Potter, professor of oncology and one of the world's leading cancer research scientists;

Prof. Henry L. Ahlgren, a leader in bringing the benefits of research to practical application on Wisconsin farms;

Prof. Verner E. Suomi, distinguished meteorologist and leader of the UW research team responsible for producing one of the satellites;

Prof. J. Willard Hurst, Wisconsin's nationally known expert on the effects of law on society.

Main speaker at the luncheon on dedication day will be Prof. Michael B. Petrovich, a member of the Wisconsin history faculty since 1950 and one of the first winners of the Kiekhofer Memorial Teaching Awards for excellence in classroom instruction.

Dr. Petrovich, an authority on the history of Russia and the Balkans, recently returned from a trip through Russia where his knowledge of the language, history, and culture of the country enabled him to get a clear picture of current developments there.

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U.W. NEWS FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

2/27/58 RELEASE: SUNDAY, MARCH 2

MADISON, Wis.--(Advance for Sunday, March 2)--Dedication of the $2,400,000 Wisconsin Center Building for adult education at the University of Wisconsin will take place Friday, April 11, followed immediately by the first annual Wisconsin Center Forum, the University of Wisconsin Foundation announced today.

Wisconsin men who are world renowned authorities will speak at the Forum on such topics as satellites and meteorology, nuclear and solar energy, commerce and business, cancer research, history, world politics, agriculture, and engineering.

The dedication ceremony will begin at 9:30 a.m. with the University of Wisconsin Foundation formally presenting the Wisconsin Center Building to the University and the State. Howard I. Potter, Chicago, and Frank V. Birch, Milwaukee, chairman of the board and president respectively, will represent the Foundation.

Regent Pres. Wilbur N. Renk, Sun Prairie, will accept for the regents while University Pres. E. B. Fred will speak on what the building will mean to the University's overall program. A "Roll of Honor" giving names of more than 10,000 people who have contributed to the Wisconsin Center Building will go on public view for the first time.

The first Forum session will open in the Center Auditorium at 10 a.m., to be followed by luncheon in the nearby Memorial Union. The afternoon Forum will open at 2:30 in the Center Auditorium. Final event will be a dinner at 7 p.m. in Great Hall of the Memorial Union.

Distinguished University faculty members appearing in the morning Forum, and their subjects, include:

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2-27-58

Add one--Wisconsin Center

Prof. Farrington Daniels...Chemistry and Energy

Prof. Robert W. Marshall...Engineering

Dr. Van R. Potter...Cancer Research

Prof. Henry L. Ahlgren...Agriculture

Toastmaster for the luncheon program will be Provost J. Martin Klotsche of the University of Wisconsin-Milwaukee. The speaker will be Prof. Michael Petrovich on the subject, "War and Peace, 1958."

The afternoon Forum will include the following speakers and subjects:

Prof. Merle Curti...Social Studies

Prof. W. Donald Knight...Business and the University

Prof. Verner E. Suomi...Satellites and Meteorology — biog.

Prof. J. Willard Hurst...Law and Society

Closing remarks will be made by Dr. Ira L. Baldwin, UW vice president of academic affairs.

Moderators for the various sessions will be Deans Mark H. Ingraham of the College of Letters and Science; John Z. Bowers of the Medical School; and Profs. Helen C. White of the English department and Fred H. Harrington of history.

Toastmaster for the dinner program will be Foundation Pres. Birch. He will call on the following for brief remarks: Gov. Vernon W. Thomson, University Pres.-Elect Conrad A. Elvehjem and Herbert V. Kohler of Kohler, chairman of the Foundation's Center Fund Campaign.

Principal speaker will be Earl D. Johnson, New York, senior vice president of General Dynamics Corp. Johnson is a Wisconsin graduate and a former undersecretary of the Army.

By far the most ambitious project undertaken by the University of Wisconsin Foundation since its founding in 1945, the new Wisconsin Center Building will cost an estimated $2,400,000 including building and furnishings. When presented to the University and the State on April 11, it will be completely paid for out of contributions made to the Foundation by public spirited citizens and loyal alumni.

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Planned solely to serve the "Wisconsin Idea" of extending the educational benefits of the University to all citizens of the state, the Center Building will become the meeting point for hundreds of adult groups coming to the campus to share subjects of common interest with University faculty members. It is estimated that the Center Building's facilities will be used by 50,000 to 60,000 Wisconsin citizens for seminars, conferences, and short courses each year.

The modern three-story structure is equipped with lecture, conference, discussion and committee rooms of varying size which will permit groups to meet in quarters best suited for their requirements. Provisions have been made for televising and kinescoping meetings so that others may later receive the benefit of these gatherings.

Though the dedication of the Wisconsin Center will mark the completion of the Foundation's largest single project, it is carrying on many other important activities for the University and the people of Wisconsin.

Included are such undertakings as scholarships, fellowships, professorships, purchase of real estate, special apparatus and equipment, and other services that are described by the Foundation as the "extras" which make the difference between a good educational institution and a great university.

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MADISON NEWS

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

2/17/58 kg

RELEASE: Immediately

MADISON--Four University of Wisconsin experts on man and the space age will discuss the implications and applications of man-made moons in a special symposium, Thursday, Feb. 20, at 8 p.m. in Agriculture Hall auditorium.

Sponsored by Gamma Alpha and Sigma Xi graduate scientific societies, the "Symposium on Earth Satellites" will be open to interested graduate students and the public.

The panel will be moderated by Prof. Ragnar Rollefson, chairman of the UW physics department and acting director of the Midwestern Universities Research Association (MURA).

Other symposium speakers will be: Profs. Albert Whitford, chairman of the astronomy department and director of Washburn observatory, Verner Suomi, meteorologist and director of the UW satellite project, and Howard Becker, of the department of sociology and anthropology..

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U. W. NEWS

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

1/8/58 kg

RELEASE: Sunday, Jan. 12, 1958

MADISON, Wis.--(Advance for Sunday, Jan. 12)--Anyone in Wisconsin, Iowa, Illinois, or Minnesota found a small sturdy cardboard box attached to a bright red paper parachute lately? Just bundle up the box and drop it in the nearest mailbox or give it to your postman.

That's the request of a University of Wisconsin--Weather Bureau team that is sending the balloon-borne boxes of radiation instruments 15 or 16 miles into the upper atmosphere.

Biog

Meteorologists Verner Suomi, director of the UW earth satellite project, and Peter Kuhn of the U.S. Weather Bureau research staff have recently stepped up their program of sending the boxes aloft. So far, they have only been getting back about a fourth of the boxes.

"If we can boost this to 50 per cent," says Kuhn, "it will not only allow us to launch more flights, but will cut the cost to taxpayers from $45 a flight to $22.50."

Suomi and Kuhn are using highly-sensitive radiosonde instruments to measure radiation at different altitudes. The instruments measure radiation, temperature, pressure, and humidity aloft and relay this information back to the scientists on earth.

Kuhn explains that the measurements are being used to improve forecasting of violent night storms, pinpointing of tornado movements, and in general unraveling the secret of the complex heating and cooling in the upper atmosphere, "This heating and cooling process determines a large part of the world's weather," says Kuhn.

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Ad one--

Kuhn points out that the cardboard instrument container is already "franked" and addressed to the University. All returns will be acknowledged by the meteorologists.

The two researchers began preliminary operations last summer. They have recently increased their launchings to one every third night from a site overlooking Picnic Point on Lake Mendota. Six-foot helium-filled balloons are used to lift the instruments to a height of 80,000 to 90,000 feet.

Because of strong winds at these high altitudes," Kuhn explains, "the instruments may be carried more than 100 miles in any direction from Madison. When the balloon bursts after an hour or so of flight, a red paper parachute opens and eases the landing for the cardboard box."

To increase chances for recovery, the two scientists are using 100 feet of red cord on all their winter flights for contrast against snow-covered fields.

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CUT LINES

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

1/8/58 kg

Biog. file

Sunday, Jan. 12, 1958

RELEASE:

See Meteorology, Dept of for "pix".

MADISON, Wis.--(Advance for Sunday, Jan. 12)--Ready to launch a boxful of radiation instruments 16 miles into the upper atmosphere are Weather Bureau researcher Peter Kuhn (with box) and assistant K. D. Gardels. Kuhn and University of Wisconsin meteorologist Verner Suomi are asking cooperation of residents in a four-state area around Madison in returning the boxes to the University. The radar, at left, is used to receive vital weather information from the balloon-borne equipment.

--Gary Schulz Photo

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FEATURE STORY

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

12/31/58 vh

RELEASE: Immediately

By VIVIEN HONE

MADISON, Wis.--Officially man's greatest concerted probing of planet earth--the International Geophysical Year--comes to an end as the 1959 bells ring out, but for some University of Wisconsin scientists who have made significant contributions to IGY the date means little more than "business as usual."

Badger meteorologists and geophysicists began work on the giant 19-month international program well before its June, 1957, start and still will be deciphering or extending IGY research for months, possibly years, from now.

"The present program has merely scratched the surface," Dr. George P. Woollard, head of the UW's geophysics section, said this week. He was speaking particularly of IGY studies on the frozen continent of Antarctica, but for scientists, knowledge-hungary, insatiable pioneers, this might be true of the entire 66-nation undertaking.

However, for a public less knowledgeable of scientific worlds to conquer, the IGY results already will appear impressive...And they will grow ever more so as research that has been carried out around the globe, under its surface, and into the atmosphere is correlated and reduced to final meaning.

Look first at the findings and indications from Antarctica where teams of Wisconsin geophysicists, joined with other parties, have waged some of their most dramatic man-against-nature battles to learn their answers. Employing modern instruments and methods for measuring the the earth's magnetism, gravity, and seismic disturbances, they have learned something about the phenomenal thickness of the great ice sheet that mantles and weighs down the "Down Under" continent--at its greatest

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the ice thickness there is more than 10,000 feet. This great mass wauld indicate that the land surface so deeply buried beneath is actually 5,000 feet below sea level.

Their investigations have pointed to a warping of the earth's crust beneath the colossal ice weight--and have shown the configuration of mountains and valleys of the buried rock surface. They have indicated how well a balance has been achieved in some parts between the forces which tend to elevate Antarctic crustal rocks and the forces which tend to depress them. Hence they have revealed something about the mechanical behavior of the mantle rocks for a given stress caused by the ice load.

The observations have resulted in valuable information on mineral nature of the underlying rocks and even suggested that the frozen single continent may in fact be two continents or, possibly, even a series of islands. Finally, the work of the Badgers has produced important geodetic data concerning the overall shape of the earth.

To wrest this information from a reluctant earth, it has taken eight Wisconsin men and their worthy companions through an endurance test of darkness, long months of isolation, and bitter cold. It has required grueling traverses across barren ice fields--for thousands of miles, for hundreds of measurements taken at three, five, ten and thirty-mile intervals.

A Data Reduction Center, one of two provided with National Science Foundation funds to relate and interpret observations made at Antarctica, was established at Wisconsin in the fall of 1958 and is expected to operate for at least a year. Here, under Dr. Woollard's direction, the men who gathered their material from "the most hostile environment on earth" will draw final meanings from their data.

U.S. participation in "mankind's greatest single quest for knowledge" of the earth we live on--and its oceans, sun, and atmosphere--has called on the talents of hundreds of America's top science minds and has required a Congressional appropriation of $13 million to support it. A total of 13 areas of investigation in the huge international search has included work in meteorology, latitude and

[Suomi, Verner]
(See Ad III)
12/31/58

longitude determinations, ionospheric physics, the aurora borealis and airglow, solar activity, cosmic rays, glaciology, oceanography, rocket exploration of the upper atmosphere, and in gravity, magnetism, and seismic disturbance.

Less spectacular perhaps than the Antarctic efforts but no less important have been other Wisconsin geophysics contributions to IGY. Teams of Wisconsin men have flown or otherwise traveled into North Pole territory and to thousands of points between the polar extremes to establish a world network of gravity measurements.

The mass of the earth exerts an attractive force--gravity--on all bodies on earth. However, Dr. Woollard has pointed out, for a number of reasons, gravity is not the same at all points on earth, and measurements of these variations from place to place are revealing the true shape of the earth, the thickness and mass of its crust, and such things as the location of ore bodies and buried mountains.

Working with two major types of measuring instruments, gravimeters and pendulum equipment, UW geophysicists during the IGY program have extended an already established Wisconsin project for accomplishing the world gravity network, achieving thus far in global coverage more than 3,000 stations in 85 countries toward the goal of a unified and controlled system. Large gaps still exist as IGY officially closes, and must be filled with other stations before the goal is reached.

Also in an effort to increase the reliability of gravity measurements, Wisconsin men have carried forward under IGY another initiated Wisconsin program. This effort is toward standardization and greater reliability of measurements. It has been pushed ahead for chains of measurements widely spaced throughout the world and made with quartz pendulum equipment.

The pendulums are less sensitive instruments than gravimeters but more reliable for measuring the overall changes in the earth's gravity field. Accurate key points established by the UW scientists are serving as links between the gravity networks of many countries and as a standard for calibrating the more sensitive gravimeter. Further, early measurements revealing systematic error have been replaced with better ones with the help of the pendulums.

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The standardization control network has proceeded along four meridianal lines--Alaska to Chile, Greenland to Argentina, Norway to East Africa, Japan to Antarctica--and touched at sites in more than 34 countries.

Wisconsin's seismic measurement contribution to IGY has been carried out at four sites in addition to Antarctica. Made in Michigan's Keweenaw Peninsula, in Wisconsin, Arkansas, and the Mexican Plateau, all have been concerned with the thickness and composition of the earth's crust. By the method which utilizes explosive blasts to create shock waves, then measures the time it takes for shock waves to travel through the earth, the character and variation of sub-surface rocks down to the core of the crust at an average depth of 35 kilometers has been either established or strongly suggested.

It has been said that one of the most important discoveries, if not the most important in IGY has been the "unequalled cooperation of scientists from all nations of the world." So successful has the venture been that a new international program of further research in geophysics and related sciences is beginning with the New Year. The men at Wisconsin will have their important share in these undertakings. Dr. Woollard is already pointing the way.

Meantime his colleagues and their assistants in Wisconsin's meteorology department are still waiting for their major IGY efforts to bear fruit. It is they who have built the tiniest sort of instruments to measure three types of radiation and thus determine the amounts of energy reaching the earth from the sun and returning to space. Recorded data on radiation energy output and energy loss over the world is fundamental to study of the earth's weather.

But in the words of Prof. Verner Suomi, UW meteorologist, the four tiny thermometers no larger than specks of dust, the midget recorders, remain "an incomplete package" until the Vanguard rocket to carry them soars into space from moorings at Cape Canaveral, Fla., and is successfully orbited.

Then and only then will Wisconsin scientists know whether their long hours of invention and exquisitely fine construction have paid off. Temperature recordings, if successfully transmitted to tiny tape recorders and played back to receiving stations on earth as the satellite passes overhead, will indeed give the Wisconsin men a private triumphant punctuation marking their own limits and dimensions for the International Geophysical Year.

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FEATURE STORY

[Suomi. Verner]
See complete set.
in IGY folder

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

7/2/57

RELEASE: Immediately

(Editor's note: This is the last of three articles on the University of Wisconsin's participation in the International Geophysical Year (IGY). This article describes the work of the gravity program under the direction of Prof. George P. Woollard.)

By RALPH CLARK

MADISON, Wis.--The University of Wisconsin will literally be the "gravitational center of the world" during the International Geophysical Year (IGY) when it becomes the activity headquarters of a world-wide gravity program -- designed to learn more about the shape of the earth and its structure. X

"The program will be carried out by groups from several nations," Prof. George P. Woollard of the UW geophysicsdepartment and chairman of the gravity program, explains.

"The United States will be participating in all phases of the program, and the responsibility for a major portion of the over-all program lies with participants from this country," he points out.

Other groups beside the University of Wisconsin participating in the gravity program include the Lamont Geological Observatory of Columbia University, the Woods Hole Oceanographic Institution, the Arctic Institute, and the University of California at Los Angeles. The IGY began July 1 and will continue for 18 months.

The gravity program comes in five parts:

One, the establishment of a more accurate unit of gravity measurement that will be internationally adopted to replace several different standards now in use.

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Two, the measurement of gravity in literally thousands of locations over the world to learn more about the geoid, or the shape of the earth.

Three, gravity studies to learn more about mountain ranges, and the thickness of the earth's crust.

Four, geophysical and geological measurements in the polar and other unexplored regions, particularly regarding the thickness of ice in the polar regions.

Five, measurements of the earth's tides and their relationship to geology and earth structure.

The margins of ocean basins and continental regions, the area where there is a marked transition in crustal structure between the oceans and continents, will be explored, Woollard explains. This exploration will take the form of a combined land and sea program involving both gravitational and seismic measurements.

This work will be done off the eastern and probably western coasts of the United States, he adds.

In the past few years, it has been found that the Colorado plateau and Rocky Mountains do not have great roots extending 40 to 50 miles into the earth as their heights would indicate, Woollard explains. Instead, the continental crust is hardly different in structure from that found in the low lands, being about 18 miles thick.

"The result is that scientists can't anticipate continental structure," he points out. "This problem will be investigated using large explosive blasts to create artificial earthquakes and the shock waves will be studied. Such measurements are planned in South America, Mexico and the United States."

Ice thickness will be measured in a similar manner in the Antarctic. Results of preliminary measurements have already shown that beneath the Marie Byrd Plateau the ice is more than 10,000 feet thick. This means, Woollard explained, that the land surface there is actually 5,000 feet below sea level.

Pendulum measurements -- using a device not unlike the pendulums of antique clocks for the gauging of the earth's gravitational pull -- will be made in carrying out the gravity unit standardization program. Measurements have already been made between Fairbanks, Alaska, and Paso Cortex, Mexico, and between Oslo, Norway, and Capetown, Union of South Africa.

"It is planned during the IGY to start another line of measurements from Thule, Greenland, extending down the east coast of North and South America to Cape Horn and to extend the Alaska-Mexico line down the west coast of South America to Santiago, Chile, Woollard explains.

It is also planned to initiate a new line from the Aleutian Islands along the east coast of Asia through Australia to Antarctica -- all for the purpose of integrating the world's gravity data to better understand the earth's gravity fields.

More than 3,000 sets of measurements, using spring-type gravimeters, have already been made in 85 countries by UW scientists, Woollard says, but much more of the earth needs to be covered.

"For example, no measurements have been made in areas under communist control," he points out. "It is hoped that during the IGY it will be possible to make sufficient measurements in areas that have been politically inaccessible. Data of these countries can then be integrated into a unified whole with those measurements of the rest of the world."

If this can be done, he adds, much of the uncertainty concerning the actual shape of the earth can be clarified.

Gravity measurements in the ocean areas constitute one of the major problems of the IGY, Woollard points out. All observations must be made from submarines.

In measuring the structural transition from the continental areas to the bottom ocean areas, however, -- a study which is a major part of the UW program -- gravimeters can be used in the relatively shallow waters of the continental shelf.

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Ad three-Geophysical Year

Gravity and seismic measurements from blocks of floating ice in the Arctic Ocean began the first of June. Because of their large mass and stability -- as compared to a surface vessel -- satisfactory measurements can be made from the ocean surface which are not possible by other means, Woollard explains.

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FEATURE STORY

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

file biog

3/22/57

RELEASE: Sunday, March 24

By RALPH CLARK

MADISON, Wis. (ADVANCE FOR USE SUNDAY, MARCH 24)--Earth satellites--due to be rocketed into space next year--will be carrying thermometers and a miniature tape recorder to help give scientists a better understanding of the earth's future weather conditions.

A University of Wisconsin professor, meteorologist Verner E. Suomi, has a $50,000 grant from the National Science Foundation to work on the plan. It is one of four experimental proposals receiving top priority for the satellite project.

Suomi's apparatus will measure three types of radiation to determine the amounts of energy reaching the earth from the sun and returning to space--a factor which dictates the world's weather.

The sun is the source of all the earth's energy and has an estimated temperature of 10,300 degrees Farenheit. Only an extremely small portion--but, nevertheless, a huge store of energy--is captured daily by the earth.

This heat which is carried through the atmosphere--in the same manner that heat from a stove warms a cold room--is called radiation by meteorologists. This radiation is the only important form of heat in the vast space between the sun and the earth.

When this radiation enters the earth's atmosphere, most of it passes through the atmosphere to the earth's surface.

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Much of this energy is reflected off the earth, however, and returns to space when clouds or clean snow are present. This is called reflected radiation.

The third form of radiation is terrestrial--invisible heat rays--which is radiated out to space by the earth and its atmosphere.

These three radiation processes will be studied by Suomi.

Next year, when the satellites, measuring about 20 inches in diameter, reach their orbit some 200 to 600 miles up into the earth's atmosphere, four short radio aerials on the tiny objects will snap into position.

These antennas will carry electrical impulses to a magnetic tape recorder inside the satellite as it whirls around the world. These impulses will be transmitted to the earth by radio signals when the satellite is over a special receiving station.

By placing small thermometers on the ends of these antennas, Suomi hopes to get separate measurements for the three kinds of solar radiation.

One of the thermometers will be white, one black, and two will be shielded in such a way that they will face only the earth as the satellite speeds through space.

The satellites will enable scientists for the first time to measure the energy coming in and that going out of the atmosphere. The difference will be the net amount retained by the earth and atmosphere.

Readings from these instruments will be magnetically recorded on equipment originally developed by Prof. J. A. Van Allen and George H. Ludwig of the University of Iowa but being built at the UW College of Engineering, and the information will be relayed to earth.

A satellite whose orbit is selected to sample as much of the earth's surface as possible "offers an ideal platform from which measurements of the radiation balance of the earth can be made," Suomi explains.

One advantage is that the instrument will be used to understand and measure radiation activities over a large fraction of the globe.

These activities can be likened to the operation of a greenhouse where the glass roof allows solar radiation waves to pass through but prevents heat radiation from passing back out. Many of these waves are absorbed by objects inside, but some of this energy is reflected and becomes lost through the glass. Much of the heat, however, is trapped in the greenhouse and the building remains warmer than the outside air. Similarly, the earth, inside its atmosphere, is warmer than outer space.

The more the sun heats up the earth, the greater will be the amount of energy sent back into space by radiation. This rate of heat loss and the amount of heat received from the sun must exactly balance over a long period of time to prevent the earth from becoming either hotter or colder.

While meterologists are aware of the long term balance over the years, they want information on the short term balance.

"We need to know if this balance fluctuates or if it is relatively constant," Suomi explains.

The data on energy input and energy loss over the world to be obtained from the earth satellite is fundamental to a study of the earth's general climate and the weather, Suomi points out.

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U. W. NEWS

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

4/16/55

RELEASE: Immediately

MADISON, Wis.--The University of Wisconsin regents Saturday accepted a $250,000 gift from the Rockefeller Foundation for research on methods to trap and directly utilize the energy of sunlight.

The research program at the University of Wisconsin will be under the direction of Farrington Daniels, chairman of the University's chemistry department and solar energy expert.

Dr. John A. Duffie of the University's College of Engineering will have charge of the administration and coordination of the University's solar energy research program.

The Rockefeller grant gives an enormous boost to the University's existing solar energy research program, which at the present time is carried on by scientists in many University departments and schools. A solar energy research laboratory has been set up in a building formerly occupied by the University's Primate Laboratory.

The gift will support a four-year research program at Wisconsin.

In outlining the program, Prof. Daniels pointed out that "there is little chance in the near future of solar energy competing with coal, petroleum, and electricity in the industrialized nations, but there is a good chance of its competing now with animal power and human labor.

"The situation calls for a new research approach," he added, "with emphasis on low-cost equipment and simplicity. The development of cheap plastics is offering new hope for the economical use of sunlight."

-more-

Sunlight is so diffuse and of such low intensity, he explained, that large areas have to be used to collect sufficient heat to be useful.

"An area of ground can be covered with plastic collectors and containers at only a fraction of the cost required for glass, metals, concrete, and other materials," Daniels added. "Rolls of plastics are light in weight and easily transported."

Prof. Daniels said that the research program might produce results which would help eventually to make solar energy more useful, even in the more industrialized areas.

The Rockefeller-financed research at Wisconsin would stress the development of solar cookers, solar distillation of salt water, solar-operated refrigerators, solar engines and irrigation pumps, and other means and methods of using solar energy.

"Attention would be given to problems of solar radiation measurement, to the development of solar-energy collectors, and related research," Daniels said. "The long-established program at Wisconsin on the growth of algae will be expanded to emphasize harvesting and drying and other features connected with the practical use of algae."

Field experiments to test the laboratory developments will be an important part of the program, Daniels continued.

"Tests would first be made in areas of the United States which are sunnier than Wisconsin," he said. "After practical working devices are fully tested here, they should be tested under primitive conditions by the people who will most likely use them most extensively."

Daniels pointed out that solar energy-operated cookers, irrigation pumps, refrigerators, and other devices would find their greatest usefulness in non-industrialized areas such as India, Egypt, and Mexico.

"In some areas the demands for heating and cooking have led to the removal of available trees, shrubs, and grass, with the consequent acceleration of soil erosion and still greater agricultural poverty," he said.

"Some desert lands have been created in part by destruction of the vegetation resulting from the demand for heating and cooking fuel," Daniels added.

Daniels said the women in one area of western Mexico walk six miles to obtain twigs and firewood for cooking and heating. Cooking in northwest India is now done with camel and cow dung. Cheap solar cookers can make such material available for good, much-needed fertilizer instead of for interior fuel.

"Refrigeration is badly needed in the non-industrialized areas to conserve the supply of food, to decrease some of the causes of disease," he said.

"Solar refrigeration is certainly possible, but extensive research is necessary to make it economical," Daniels added.

Additional research is also needed to make solar distillation of salt water less expensive, Daniels continued. "Solar distillation could supply drinking water for people and animals and make possible a limited amount of irrigation where water has a high value.

"In addition to research on how to utilize solar energy immediately, a minor part of the program will be devoted to long-range studies of photochemistry, photosynthesis, photo-electricity, and the storage of electrical energy," Daniels continued.

"It is hoped that this four-year program will enable us not only to help solve some of the pressing problems of the non-industrialized areas of the world, but enable us also to evaluate possibilities for the more general utilization of solar energy," Daniels said.

Research on many aspects of solar energy utilization has been conducted at the University of Wisconsin for years. One of the oldest projects has been the study of the energy efficiency of photosynthesis--the amount of solar energy needed by living, green plants to build sugar from simple carbon dioxide and water.

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 4-16-55

Some of the other projects carried on at Wisconsin have been concerned with growth of algae in lakes, fundamental studies in meteorology and loss of heat from the earth, distillation of salt water, and the design of agricultural buildings.

In 1953 a group of about 20 scientists interested in solar energy utilization organized to meet and discuss the various solar research projects from time to time. The steering committee consists of Assoc. Dean William R. Marshall of the College of Engineering, Prof. William B. Sarles of the bacteriology department, Prof. Floyd W. Duffee of the agricultural engineering department, Prof. Verner E. Suomi of the meteorology department, Dr. Duffie, and Prof. Daniels.

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U.W. NEWS

1/19/55

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

RELEASE: Immediately

By ROBERT FOSS

MADISON--The University of Wisconsin has begun work on a campuswide research program seeking ways to tap the energy of another great source of power--the sun.

Following a two-year study of the world's research in the field of solar energy utilization, the University has now set up a research program aimed at studying engineering methods for capturing the energy of the sun's rays and putting it to work for mankind's benefit.

The program, organized for coordination under the UW Engineering Experiment Station, is a joint effort of a half dozen UW departments.

The program is under the direction of Prof. Farrington Daniels, chairman of the UW chemistry department, and Dr. John A. Duffie, project associate in the Engineering Experiment Station, who is also engaged in related fundamental research studies in cooperation with the UW department of chemical engineering.

Dr. Daniels has recently returned from a trip to New Delhi, India, where he participated in a meeting on solar and wind energy sponsored by UNESCO.

A book entitled "Solar Energy Research," edited by Daniels and Duffie, is to be published by the University of Wisconsin Press next spring. It contains articles on various subjects by many of the authorities on solar energy who are now active in research in this field. Most of the papers were presented at a symposium on solar energy utilization held at the University in September 1953, supported in part by the National Science Foundation.

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ad one-solar energy

1-19-55

Some of the main engineering problems to be studied under Wisconsin's solar energy utilization research program are:

(1) The development of low cost solar engines;

(2) Fundamental problems in collecting and storing solar energy for space heating;

(3) Solar cooking and refrigeration;

(4) Combined use of a heat pump and solar energy for heating buildings; and

(5) Conversion and utilization of solar energy through biochemical processes.

Other UW departments associated with engineering departments in the coordinated research program are chemistry, meteorology, bacteriology, and agricultural engineering.

Coordination of the research is through a steering committee composed of UW faculty members, Prof. Daniels and Dr. Duffie; Prof. Floyd Duffee, agricultural engineering; Dean William R. Marshall, chemical engineering; Prof. William B. Sarles, bacteriology; and Prof. Verner E. Suomi, meteorology.

The program is supported in part by the National Science Foundation, the John Simon Guggenheim Foundation, and the Wisconsin Alumni Research Foundation.

Headquarters for the research program will be a building on the UW College of Engineering campus near the Highway Engineering Building just off Randall Avenue. The building, formerly used by the University's psychology department for animal psychology research, is now being remodeled into an experimental solar laboratory.

- more -

ad two-solar energy

Changes are being made in the building for solar energy "collectors" to be placed on the south side of the roof in such a way that the collected energy can be transported inside the building to be used for heating the building or for other experimental purposes. This laboratory will provide space for part of the solar energy research and will itself provide for development of improved methods of solar house heating, under present plans.

Some of the research projects relating to solar energy utilization now under way in UW departments are: development of low cost solar engines, in the departments of chemical engineering and chemistry; correlation of climatological data and measurements of the distribution of solar energy striking the earth, in the meteorology department; studies of biological and engineering aspects of algae growth, in the departments of bacteriology, botany, and civil engineering; and evaporation and condensation of water from salt water in plastic bags, storage of solar heat in crystals, thermogalvanic cells, and energy efficiency in photosynthesis, all projects of the chemistry department.

An experimental solar type farrowing house for pigs is under development and construction by the agricultural engineering and animal husbandry departments. It is being erected at the La Crosse Agricultural Experiment Station farm. This structure is to have four completely separate sections all facing south and is readily adaptable for use with any other type of the smaller farm animals or fowl.

UW scientists, while optimistic concerning the results of this program, do not expect that wide use of solar energy will be made in the immediate future in this part of the world. They feel that much work remains to be done in solar energy research before widespread application will be made in highly developed countries like the United States, but that some uses are now practical in less highly developed areas of the world.

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10/25/55

New appointments and elections to the older UW faculty committees for the 1955-56 school year include the following:

ADMISSIONS: Profs. M. J. Andrew, J. L. Margrave, J. W. Rothney, and J. F. Stauffer;

ALL UNIVERSITY LECTURES: Profs. F. G. Cassidy and C. C. Watson;

ALUMNI RECORDS: Prof. K. E. Lemmer;

ARBORETUM: Profs. Grant Cottam, L. E. Engelbert, G. W. Foster, A. D. Hasler, and I. C. M. Place;

ATHLETIC BOARD: Jack Mansfield, president of Student Athletic Board;

AUDITORIUMS: Vice President J. Kenneth Little;

BADGER BOARD ADVISORY: Prof. J. B. Bower;

BASANTA KUMAR ROY LECTURESHIP: Prof. W. F. Goodwin;

CIVIL DEFENSE: Profs. H. H. Barschall, M. J. Musser, W. H. Southworth, and student member R. E. Schallert;

CLASSIFICATION OF PERSONNEL: Prof. E. E. Witte, chairman, and Prof. Erwin Gaumnitz;

CO-OP BOARD OF TRUSTEES: Student members E. D. Lillydahl, Jr., and D. S. Ruder;

COURSES: Deans O. A. Mortensen and J. H. Westing, Profs. C. F. Edson and Harold Groves;

DIVISIONAL COMMITTEES: Physical Sciences and Mathematics--Profs. T. J. Higgins, chairman, P. S. Myers, H. T. Richards, V. E. Suomi, and S. A. Witzel; Humanities--Profs. W. T. Bandy, H. M. Howe, and R. F. Langer; Biological Sciences--Profs. N. N. Allen, T. C. Erickson, Paul Settlage, and Folke Skoog; and Social Studies--Profs. C. S. Bridgman, Vernon Carstensen, L. D. Epstein, and C. W. Harris.

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MADISON NEWS

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

8/20/53

RELEASE: Immediately

MADISON--Four University of Wisconsin meteorologists are taking part in an Air Force sponsored research project on the various problems of turbulence at the Great Plains Field Experiment being conducted at O'Neill, Nebr., Prof. Reid Bryson, chairman of the department, announced today.

Meteorologists from Wisconsin and nine other organizations are taking part in the project. The Wisconsin group is under the direction of Prof. Verner E. Suomi. Those assisting him are Norman Islitzer, Lee Sims, and William Lowry.

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FEATURE STORY

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

8/21/52

RELEASE: August 28, Thursday

By SELMA PARKER

Madison, Wis.--Secret waves, surging fathoms deep, make Lake Mendota's subsurface fascinating as any human's subconscious to University of Wisconsin meteorologists.

Just as psychiatrists find emotional turmoil beneath calm exteriors when they study temperament, these scientists were studying Mendota's "temperament," her flexible temperature layers, when they found that the lake can look like a glassy mirror and still hide violent waves.

The four meteorologists, who are now engaged in a concentrated attack on their water project, after three exploratory years of "coke-bottle" fishing in the lake and "bathtub sloshing" in the laboratory, are Reid Bryson, department chairman, Charles Stearns and P. M. Kuhn, meteorology research assistants, and R. A. Ragotzkie, working on a joint Ph.D. in Meteorology and Zoology.

Strange fishing calls for strange gear--and instead of the conventional fishhook, Bryson and Stearns dangle a five-pronged hook sealed in a coke bottle from the end of their line.

The hook is one end of a thermopile that picks up the temperature at a fixed depth and sends it up to a thermocouple amplifier in the boat. The portable amplifier, unlike anything available on the market, was perfected by Stearns, under the direction of Prof. V. E. Suomi. Temperature variations appear as wavy lines on a roll of graph paper.

-more-

If there were no waves below, there would be no pronounced temperature ripples on the graph, because ordinarily the "thermocline", the sharp borderline between the warm upper layer and the cold one beneath, remains at a fairly stable level.

But violent waves do exist, and they churn the hot and cold layers at the thermocline. The temperature at one spot shoots up, drops down, over and over again, and its pattern is repeated in miniature on the graph.

What causes this subsurface turmoil? On a windy day the top waves are pushed along the lake, piling up the water at one end. The waves, the water pile-up, and underwater ledges are responsible for pressure differences that create new waves at a lower level.

Twenty-four hours later, the lake may have settled to a silky smoothness externally, but these internal waves are still rolling along effortlessly, often larger than surface waves because they represent less energy.

"It would take a 60 mile-an-hour wind to raise four-foot waves at the top," says Bryson, "but so little energy is needed to deform the inner surface that half-foot waves of the upper level are equal to ten-foot waves below. There is little to stop them until they get deep enough to be chopped up by lakebottom irregularities."

The more violent the waves, the better Bryson likes it, because he needs a violent answer for the question bothering him and his colleagues. Here's the way Bryson explains it:

"The summer sun heats Mendota's warm upper layer degree by degree until about the middle of July. Then the temperature stands still, and something new begins--the warm layer moves steadily downward, until by September it has pushed the thermocline and the cold layer out of existence.

-more-

"What heats the water so far below the surface? None of the offhand answers will do. The sun can't penetrate that far, and Mendota's most sensational windstorms only dent her surface. Molecular exchange of hot and cold water at the thermocline?--That would take years, not days.

"No, it takes some pretty violent mixing to heat up a whole lake in a hurry. It's our hunch that these lower waves, whose existence we've proved, are strong enough to do the trick. We're gathering data now, and we hope to prove that the waves are like a giant mixmaster, with the lake a bowl in which hot and cold are blended to a 'batter' of uniform temperature."

Ragotzkie and Kuhn are the "bathtub team." Working with a tank model in the laboratory they have created subsurface waves that break at one end of the tank, and have studied the new underwater wave crop. Comparing lake and tank statistics, they have just prepared a report, "On the Nature of Fresh Water Internal Waves."

Laymen might feel that the meteorology department, having proved that rough underwater waves exist, already has the answer to the question of what warms up Lake Mendota. But scientists don't reach conclusions that swiftly.

"We need a lot more data, a great deal more research, before we can call this idea more than just a hunch," says Bryson.

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U. W. NEWS FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

2/6/52

RELEASE: Immediately

Madison, Wis.--An internationally-known meteorologist from Finland will be active in the research picture as a project coordinator at the University of Wisconsin during the coming year, the University announced today.

He is Matti Olavi Franssila, chief of the weather forecasting section of the Finnish department of meteorology. He also lectures regularly at the University of Helsinki.

Franssila came to the UW at the invitation of Prof. Verner Suomi, chairman of the department of meteorology, and will work closely with Suomi and Prof. Reid Bryson. He is a specialist on the heat budget and his special field is microclimatology. Franssila studied at the University of Helsinki, and received his master's degree in 1929 and his doctorate in 1936. He also studied for a time in Potsdam, Germany, in 1935.

He arrived on the campus Jan. 18, and will be at Wisconsin for about a year. His wife and four children plan on joining him next summer.

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FEATURE STORY

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

2/15/51

RELEASE: Immediately

Fla

Madison, Wis.--If you did plenty of shivering during January--and who didn't?--and said "I can't remember when it's been this cold"--and who didn't?--you had good reason, 'cause it was one of the coldest Januaries in many a year. So say University of Wisconsin meteorologists.

When their cars froze up, noses got nipped, and temperature instruments sluggishly wabbled at sub-zero levels, Profs. V. E. Suomi and R. A. Bryson, and Lothar A. Joos, U. S. weather bureau station, decided to find out just how this January compared with "the old days" in the Madison area. They found:

This January the mercury plummeted to -10 or below seven times. In all previous six Januaries combined, there were only 14 readings of -10 or below.

In the previous six Januaries, half the daily minimum temperatures were colder than 12 degrees. In 1951, half these readings were six or below, a drop of six degrees. The greatest cluster was at six degrees, and of those readings below six, only three fell between five above and five below. The rest were brrrer.

And, in January, 1951, there were three days colder than the coldest day of the previous six Januaries. A -37 reading set an all-time record low at Truax field station. On another occasion, the mercury stayed below zero for 65 consecutive hours, the coldest four-day period since 1936.

-more-

At the other extreme (there was some warmth during the month, believe it or not), thawing temperatures were reached during eight days. But, in spite of these "high level" readings, other periods were so cold that the monthly average temperature fell three degrees below normal.

A bountiful layer of snow accompanied 1951's frigid opening, with 20.6 inches falling. This total is the greatest for the month since 1943.

From November through January, snowfall totaled 46 inches, the most for that period since 1909-10, and with February's eight inches added, the winter total to date is 54 inches. This is more than that recorded during any full winter season since 1928-29, and with the usual heavy March snows yet to come, there is a good chance that Winter 1950-51 will set a new record for snowfall, the UW scientists say.

Goin' south?

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U. W. NEWS FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

2/19/51 RELEASE: Immediately

File

Madison, Wis.--Prof. Verner E. Suomi, University of Wisconsin meteorology department, has just come in for some high praise from a noted Finnish marine scientist who visited in the U. S. last summer.

Dr. Ilmo Hela, director of the Institute of Marine Research in Finland, toured the U. S. under a grant from the state department. His 90-day visit took him all over the country--from Massachusetts to California, Minnesota to Florida--looking over research facilities at dozens of universities and other centers. In his report on the trip, just received, he said:

"Of the American scientists whom I should like to see in Finland as a visiting lecturer, I would like to mention Prof. Verner Edward Suomi, University of Wisconsin. The Finnish scientists working in the fields of meteorology, physics of the lakes, agricultural engineering, and instrument development should appreciate the visit of this ingenious American scientist to Finland."

Professor Suomi is the only person mentioned in Dr. Hela's report.

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FEATURE STORY

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

2/8/51

RELEASE: Thursday, Feb. 15

Madison, Wis.—University of Wisconsin meteorologists have fished up a pair of new facts about northern lakes from the depths of Lake Mendota which are going to revise existing theories.

Profs. R. A. Bryson and V. E. Suomi have reported to the University lakes and streams investigating committee that they have measured currents in deep water, where present theory says none are supposed to be. And, they also reported that after a rain there are large increases in the dissolved oxygen content of deep water where the amount of oxygen normally is low.

The two scientists not only have uncovered the facts but have been able to explain them, an important step toward complete understanding of lake composition, its animal life and vegetation.

During summer months, Bryson explains, a lake basically is divided into three layers: a warm surface layer of nearly uniform temperature, which changes in depth and heat with the season; cold bottom waters, also of a nearly uniform temperature; and a middle layer, called the thermocline, which divides the other two.

The thermocline, Bryson points out, acts as an almost impermeable layer, which prevents the interchange of surface and bottom water. The thermocline disappears in the spring and fall, at which times there is a complete interchange of all lake water.

-more-

But during the summer, each level is clearly defined.

Surface currents are caused by wind, but the thermocline prevents these currents from being transmitted to the bottom layer. This gave rise to the theory that deep waters were free of currents.

Bryson and Suomi do not agree with that theory.

"We found that currents do exist in the bottom water layer and measured them," Bryson says. "We found these currents as fast as those in the surface layer.

"Our next job was to determine how these currents were created."

The explanation boils down to the fact that lakes actually tilt, and the tilting action causes a pressure which in turn causes the currents.

A lake tilts in this way:

As wind blows across a lake, it pushes surface water downwind. This skims surface water from the upwind side, reducing the depth of the surface layer, and piles it downwind, slightly increasing the surface layer depth there.

The shift of the surface layer causes the thermocline to be forced down on the downwind side, the tilting effect, Bryson explains.

"As the thermocline tilts," Bryson points out, "it exerts pressure on the downwind bottom water layer of the lake. This causes the deeper water to circulate, thus setting up the currents."

Other research studies have shown that the dissolved oxygen content of deep water increases greatly after a rain. Although rain water is cold and has a greater density (weight) than the warmer surface water, the two scientists do not believe that the oxygen-loaded rain water sinks through the thermocline, thus bringing more oxygen into the deeper waters. Their research has shown that rain water falling into a lake mixes with surface water.

ad two--lakes

"But," says Bryson, "the streams tributary to Lake Mendota provide a mechanism for carrying dissolved oxygen into the deep waters. Prior to the rain, the water from the tributaries was warmer than the warmest lake water and would be expected to spread on the surface.

"After the rain, the muddy, well-aerated runoff water is heavy. When this water enters the lake, it sinks to a level which has a corresponding density, which usually is in the thermocline or the deep water layer.

"During and immediately following the periods of extremely heavy rain, many of the streams tributary to Lake Mendota run at flood stage with cold water carrying a large load of suspended sediment and abnormal amounts of dissolved oxygen. These tributaries provide the mechanism for occasional midsummer renewal of deep water oxygen," Bryson concludes.

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WIRE NEWS FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

12/14/50

RELEASE: Immediately

Madison, Wis.--Representatives of the Illinois Water Survey division were on the University of Wisconsin campus Thursday to consult with UW Meteorologists R. A. Bryson and V. E. Suomi about water evaporation and its measurement.

Professor Bryson talked to the group on the importance of the evaporation problem in hydrology, climatology, and agriculture. Professor Suomi discussed measuring devices and gave a demonstration of equipment used at the University of Wisconsin.

##

ad one--faculty promotions

6-15-50

Those appointed associate professor included:

Robert A. Alberty, Edwin M. Larsen--chemistry; L. Reed Tripp--economics; Vernon Carstensen--history, graduate school, and agricultural economics; Reid A. Bryson--meteorology; Verner E. Suomi--meteorology, biometry, and physics; Leo J. Steffens--music; James F. Crow--zoology and genetics; Peter R. Morrison--zoology and physiology; Takeru Higuchi--pharmacy; Ruth E. Allcott, Theodore L. Harris, Francis Shoemaker--education; Hugh L. Cook, Harlow W. Halverson--agricultural economics; Dale W. Smith--agronomy; Robert W. Bray--animal husbandry.

Joshua Lederberg--genetics; Mrs. Iva R. Mortimer--home economics; Burdean E. Struckmeyer--horticulture; Gerald E. Annin--poultry husbandry; Guy R. Spencer--veterinary science; Margaret A. Kohli--physical medicine; Kenneth B. McDonough--pediatrics; John W. Harman, Joseph J. Lalich--pathology; Ray E. Green--pharmacology; Quillian R. Murphy--physiology; Peter A. Duehr--surgery; Gerald A. LePage--cancer research; Robert F. Roeming, Helmut Summ, Eldon D. Warner--Milwaukee Center.

Those appointed assistant professor include:

Charles A. Boyd, Michael Wales--chemistry; Herbert M. Howe--classics; Edwin Young--economics; Robert K. Presson--English; Robert M. Gates--geology; Cornelius L. Golightly, William F. Goodwin--philosophy; Dean J. Meeker, Arthur A. Vierthaler, John H. Wilde--art education; Jesse N. Williams--biochemistry; Cloyd E. Zehner--dairy husbandry; William C. Winder--dairy industry; Stanley D. Beck--economic entomology; Vilas W. Matthias--University farms; Mrs. Kathryn R. Lohr--home economics; David T. Berman--veterinary science.

Donald Voegeli--radio station WHA; Ruben A. Imm--electrical engineering; Donald F. Livermore--mechanical engineering; James B. Bower--commerce; Hans Johan Van Baaren--pathology; Frank D. Bernard--surgery; Gerald C. Mueller--cancer research.

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RADIO NEWS

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

4/14/49

RELEASE: Sunday, Apr. 17
and thereafter

Madison, Wis.--The story of the search by two young Wisconsin scientists into the mysteries of weather and plant life will be told this week on the University of Wisconsin Symphony orchestra broadcasts on 64 radio stations in Wisconsin and Upper Michigan.

The intermission speaker, Dr. Reid Bryson, will tell of the project he and his fellow meteorologist, Vernor Suomi, are working on, a project which combines the talents of a team of experts in biology, agriculture, and engineering.

They are seeking precise measurements of the relation of weather to crops.

The orchestra will feature a group of selections included in the Wisconsin High School Music association contest repertory this year: a Bach chorale fugue, "All Glory Be to God on High;" an "Air" by Jonathan Battishill; the adagietto from "L'Arlesienne Suite No. 1;" and the "Air d'Ballet" from Carl von Gluck's opera, "Alceste."

The program will be broadcast in this area by

EDITORS: PLEASE PICK UP LOCAL LISTINGS FROM THE ATTACHED SHEETS.

Sen Sac - Wire

WIRE NEWS

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

5/1/50

RELEASE: Immediately

File

Madison, Wis.--Prof. V. E. Suomi, University of Wisconsin meteorology department, is in Washington, D. C. this week at the invitation of the government to take part in a federal conference on air pollution.

The announcement was made today by Prof. R. A. Bryson, department chairman.

While in Washington, Professor Suomi will attend the annual joint meeting of the American Meteorological society and American Geophysical union.

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U. W. NEWS FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

2/18/49

RELEASE: Monday, February 21

CUTLINES FOR ACCOMPANYING PICTURE

The warm air rising from a cigarette creates enough "wind" to be detected by this sensitive electronic device developed at the University of Wisconsin by Profs. Ried Bryson (left) and Verner Suomi (right). Air moving as slowly as a yard per minute is recorded by the instrument.

With the cooperation of four other departments on the Wisconsin campus, these young meteorologists are studying one of the fundamental problems of agriculture, how plants use their supplies of heat and water. Their findings, interpreted in terms of plant breeding and soil use, may some day prove of immense value to farmers.

By measuring the speed of sound between the two "arms" the instrument follows split-second changes in both temperature and wind.

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U. W. NEWS FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

2/18/49

RELEASE: Monday, February 21

CUTLINES FOR ACCOMPANYING PICTURE

Professor Suomi is shown mounting a new sensitive electronic wind detector on a 36-foot tower in a corn field at the University of Wisconsin. The data from this device and an equally sensitive instrument for measuring humidity, when fed into a special computer now being developed, should yield much more precise information on the amount of moisture and heat leaving and returning to the ground than was previously available.

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FEATURE STORY

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

2/18/49

RELEASE: Monday, Feb. 21

by Kenneth G. Johnson

One of the fundamental problems of agricultural research--how crops use their supplies of heat and water --is being attacked by the team work of five departments at the University of Wisconsin.

Their discoveries, interpreted in long-range terms of plant breeding and soil use, may some day prove of incalculable value to farmers.

How can such diverse departments as electrical engineering, meteorology, civil engineering, soils, and plant pathology work on the same problem? The answer lies in the complex nature of the problem and an idea of the two-man faculty of the recently-established Wisconsin meteorology department.

The two men, Profs. Verner Suomi and Reid Bryson, discovered that the University of Wisconsin owns the biggest flower pot in the world--a 120 acre corn field on the University campus.

The field was created by filling in a bay of Lake Mendota and has been used for 28 years to raise food for dairy cattle. Since it is below lake level, water seeps in from the lake. Whenever it reaches the desired level, an automatic pump sucks out the excess.

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What the young scientists realized is that the field acts as a lysimeter--a moisture-testing instrument based on the flower pot principle. The amount of moisture coming in, via rain and seepage, and the amount going out, via the electric pump, can all be measured, just as it could in a giant flower pot.

For the first time, scientists are able to study the water-temperature cycle of growing plants in a very large area under known conditions. The difference between the income and outgo is the amount used by the corn and returned to the air through evaporation.

But even this valuable data does not satisfy the scientists. They are now developing delicate instruments to follow the evaporation part of the water cycle.

Water is easy to measure when it is a liquid, but in its gaseous form it can be quite elusive.

Agriculturalists have been studying this problem using rough reports on rainfall and temperature for many years but have always been hampered by a lack of accurate data. The meteorologists hope to get continuous records, detailed with tenth-of-a-second changes, of the moisture and heat actually received by the area and used by the plants.

That information could become of major importance in the hands of plant and soil scientists.

It could help them understand the growth of plants and their needs. It could indicate the possibilities of various crops in different regions and the strains of plants worth breeding for specific conditions.

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"Although the meteorology department is working on the project under a grant from the Wisconsin Alumni Research foundation (WARF), the effectiveness of our research is greatly enhanced by the cooperation of a number of departments on the campus," Professor Suomi said. "Four departments are giving us constant aid and still others have offered valuable suggestions. The 'teamwork' approach in research is a strong Wisconsin tradition.

"Prof. Arno T. Lenz of the civil engineering department has set up a device to measure the water flowing off the field.

"Prof. Vincent C. Rideout of the electrical engineering department is helping in the construction of a computer that will come /out/ with an answer instead of a large volume of graphs. By feeding the data we obtain from our instruments into such a device, our answers will be more accurate and hundreds of man-hours, usually spent interpreting graphs, will be saved. The data will be tape-recorded in the field, then run through the computer back at the office. In this way we can not only keep an original record on tape but can keep the delicate computer in a more protected place.

"The problem is one the plant pathology department has been studying for a long time and Prof. James G. Dickson of that department has been our guiding light.

"The role of the soil in the heat-moisture cycle is pretty much a mystery to us, so we turned to Prof. Robert J. Muckenhirn of the soils department for help on that phase of the problem.

"No matter whom we have asked for help, we've always received an enthusiastic response."

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One of the instruments for gathering split-second data is a dew point indicator invented by Professor Suomi. It is many times more sensitive to changes in humidity than gauges now in use.

The instrument measures the amount of humidity in the air by finding the temperature needed to condense it, the way a cold surface takes moisture from nearby air as "sweat" on a sultry day.

Suomi's instrument uses a tiny mirror cooled by a cooled /copper/ rod beneath it. As the mirror is cooled below the dew point and condensation starts to fog it, a photo-electric eye watching the process from above turns on an electric heater. The heater is precisely controlled to balance the cooling, and the rod and heater keep the mirror's surface exactly at the dew point.

When the humidity of the air changes, the instrument's hot-cold balance shifts automatically to bring the mirror to the temperature of the new dew point. The mirror's temperature becomes an index of humidity.

A second instrument is being developed to record simultaneously the up-and-down flow of air and the temperature of that air by measuring the speed of sound in it. The speed of sound in air varies with the temperature and sound can be "pushed" or held back by the wind. This device uses principles of radio to time sound waves.

The two instruments, when combined with the electrical computer, will be called a fluxmeter. The device is expected to record continuously changes in humidity, temperature, and wind within a tenth of a second. The records of the electric pump will be used as a check against the evaporation readings of the fluxmeter. Once the instrument has proven its value, it will be usable in areas where there is no "flower pot" and electric pump to aid calculations.

Although these micro-meteorological devices were not ready for use this past summer, the researchers gathered data from their giant flower pot.

They learned, for example, that the corn and the electric pump work as a smooth-running team to take moisture out of the field. The corn "pumps" by transpiration--taking water in through its roots and permitting it to evaporate into the air.

Records of the operation of the electric pump showed that it works hard all night while the corn "pumps" are idle. At dawn, as sunlight begins to touch the field, the corn starts "pumping", reducing the water level until the electric pump can slow down.

On a hot day, the corn pumps away briskly, while on a cloudy day, it sucks out the water more slowly.

"We hope our instruments and our methods will make a worth-while contribution to this problem," Professor Suomi said. "When interpreted in relation to the studies of photosynthesis and plant growth now being conducted by University chemists, biologists, and physicists, our findings may prove of immense practical value to farmers.

"We are particularly fortunate here at Wisconsin in having authorities in a number of fields all on one campus. The work we are attempting to do is too broad to be confined to one department or even one college. The response we have received from other departments has been most gratifying."

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List of Publications

V. E. Suomi

E. W. Barrett and Verner E. Suomi: "Preliminary report on Temperature Measurement by Sonic Means", Jour. Met., Vol 6, No. 4, August 1949, pp 273-276.

V. E. Suomi and Earl W. B arrett,"An Experimental Radiosonde for the Investigation of Water Vapor in the Stratosphere.," Rev. Sci. Inst., Vol 23, No. 6, June 1952, pp 273-292.

R. A. Bryson and V. E. Suomi,"The circulation of Lake Mendota," Trans. Amer. Geophys. Union, Vol 33, No. 5, October 1952, pp 707-712.

V. E. Suomi, Matti Franssila and Norman F. Isletzer,"An Improved Net Radiation Instrument,"Jour. Met., Vol 11, No. 4, Aug. 1954, pp 276-282.

C. B. Tanner and V. E. Suomi,"Lithium Chloride Dewcell properties and Use for Dewpoint and Vapor Pressure Gradient Measurements,"Trans. Amer. Geophys. Union, Vol. 37, No. 4, August 1956, pp 413-420.

Ph.D. Thesis, University of Chicago, 1953, The "Heat Budget over a Corn Field."

K. M. King, C. B. Tanner and V. E. Suomi,"A Floating Lysimeter and its Evaporation Recorder." TAGU 37:6, Dec, 1956.

V. E. Suomi, P. M. Kuhn,"An Economical Net Radiometer"TELLUS, February 1958.

Manuscripts Accepted for Publication

P. M. Kuhn, and V. E. Suomi,"Airborne Measurements of Albedo," Journal of Meteor., May, 1958.

P. M. Kuhn, Grant Darkow and V. E. Suomi,"A Mesoscale investigation of Pre Tornado Thermal Environments,"Bull. of Amer. Meteor. Soc., May 1958.

V. E. Suomi, P. M. Kuhn and D. O. Staley,"Deviant Measurements of Infra Red Radiation Divergence to 160 mb.," Quarterly Journal of Royal Meteorological Society, April 1958 - Invited to read Paper in London June - 1958.

"Rockets and Satellites in IGY.", Chapter on"Radiation Measurements of the Earth From an Artifical Satellite," IGY Record. Pergamon Press(in press now).

The following papers in "Exploring the Atmosphere's First Mile", Vol. 1, (1957).

Sec. 2.1.3	Soil temperature integrators.	24
Sec. 2.2.2	Soil density and heat capacity	39-40
Sec. 2.4.4	Heat storage variations	79-80
Sec. 3.1	Radiation Measurements	
Sec. 3.1.3	Univ. of Wis. net radiometer	
Sec. 4.3.2	Double psychrometer lift apparatus	183-187
Sec. 5.2.4	A sonic anemometer	256-172

WIRE NEWS

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

1/6/61 jl

RELEASE: Immediately

MADISON, Wis.--Six contracts for research and services to be provided by the University of Wisconsin to agencies of the federal government were approved by the UW regents Friday.

The contracting agencies and funds involved are as follows:

Air Force Office of Scientific Research, $16,797 for research in the department of bacteriology; Atomic Energy Commission Chicago Operations Office, $22,361 for research in the department of genetics; Department of Commerce, Bureau of Public Roads, $6,000 for research in the Law School; Department of Health, Education, and Welfare, $9,000 for research in the department of preventive medicine; Department of State, 55,820 Indian rupees to finance a survey by the School of Education; U. S. Armed Forces Institute, $8,080 to provide for educational services by the Extension Division.

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Prof. Verner E. Suomi
Depts. of Meteorology and Soils
University of Wisconsin
Madison, Wisconsin

News + Publications Service
University of Wisconsin
~~News Service~~
Madison, Wisconsin

Prof. Suomi was born Dec. 16, 1915 in Eveleth, Minn. He earned his bachelor of education degree in 1938 from Winona Teachers Colege in Minnesota. He earned his Ph.D. degree in meteorology in 1953 from the University of Chicago.

From 1938 to 1943 he taught in the public school systems of Minnesota, then went to University of Chicago as an instructor in meteorology from 1943-45. In 1945 he became director of the University of Chicago's Instrument Laboratory in the Department of Meteorology. He held that post two years and in 1948 came to the University of Wisconsin as assistant professor of meteorology. He was appointed associate professor in 1950, became a full professor in 1958.

Prof. Suomi teaches an undergraduate course on the High Atmosphere and conducts a graduate seminar dealing with experimental meteorology. Though he is also with the UW Soils Department, his connection is mainly administrative. However, he has worked extensively with Soils Prof. Champ B. Tanner on water loss from soils and has worked on projects such as water evaporation measurements and on the question of how plants use their supplies of heat and water. With Dr. Reid Bryson, of meteorology, he has worked on deep-water current measurements. When Prof. Suomi came to UW, one of his main interests concerned moisture measurements in the stratosphere.

About 1953, Prof. Suomi became interested in the problem that grew into important experiments using satellites. It started with the study of a cornfield's heat budget--how much sun energy the field absorbs, how much is reflected back into the atmosphere. In effect, the satellite investigations to date have been extensions of the heat budget experiment, not for one cornfield, but for the entire earth.

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In 1954, with UW's resident meteorologist from the U.S. Weather Bureau, Peter Kuhn, Prof. Suomi developed an improved net radiometer, dubbed the "Poor Man" because it could be built economically to measure radiation. Since then, the instrument has been used at many U.S. weather stations, including those at the South Pole.

In 1956, Prof. Suomi did a sonic anemometer study of turbulence near the ground, and in 1957 a study of the phyto-climate, or plant-climate, of Wisconsin

During the International Geophysical Year, 1957-58, the work with earth satellites got under way. After two disappointing rocket failures, Explorer VII was sent into orbit on Oct. 13, 1959, carrying instruments to measure the earth's heat budget. These instruments were designed and built by a 12-man UW team under Prof. Suomi's leadership. They comprised one of seven experiments in Explorer VII, the most complex and largest satellite at that time. Results showed the great importance of cloud systems in controlling the earth's heat loss.

In November 1960, Tiros II orbited, containing an experiment designed at UW under Prof. Suomi, but built by commercial contractors for the National Aeronautics and Space Administration (NASA). This experiment measured correlation between cloud cover pictures and heat budget measurements.

Tiros III was launched in July, 1961, and Tiros IV in February, 1962. Both contained instruments and experiments designed by Prof. Suomi to extend the UW studies of the earth's heat budget and improve upon Explorer VII coverage. They also carried TV cameras to correlate cloud cover effects with heat budget data.

The great value of satellites as a research tool has now been firmly established, and Prof. Suomi and his colleagues plan several more experiments in the Tiros series.

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Prof. Suomi is a member of the Subcommittee on Meteorological Satellites on the Space Science Board of NASA and a member of the Atmospheric Sciences Panel of the National Science Foundation. During the 1st quarter of 1962, he served with the National Science Foundation in Washington as Associate Program Director for Atmospheric Sciences. He is associate editor of the Journal of Applied Meteorology. The American Meteorology Society granted him its Clarence LeRoy Meisinger Award in January, 1961, for his work in atmospheric radiation.

Prof. Suomi is a member of a Panel on Weather and Climate Modification sponsored by National Academy of Sciences and National Research Council.

Prof. Suomi married Paula Meyer in 1941. They have three children: Lois, born Sept. 27, 1953; Stephen, born Dec. 16, 1945; and Eric, born June 24, 1950.

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Prof. Suomi is director of the University's Space Science and Engineering Center, a university-wide facility to assist various staff members who want to undertake projects in space research. The center ~~is~~ presently (8/15/66) is supporting ~~(8/15/66)~~ eight UW projects totaling about $1.5 million in contracts.

Prof. Suomi was appointed to the directorship in 1965. A year earlier he was named chief scientific adviser of the U.S. Weather Bureau.

He was invited in 1965 to become a member of the Finnish Academy of Sciences and Letters, one of the highest honors an American scientist can receive from Finland.

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

Release: Nov. 21, 1978 **BIOGRAPHY** Verner E. Suomi

Professor Verner E. Suomi was born Dec. 6, 1915, at Evaleth, Minn. He received a bachelor of education degree from Winona Teachers College, Winona, Minn., in 1938, and his doctorate in meteorology in 1953 from the University of Chicago. He and Paula Meyer were married in 1941. They have three children: Lois, born in 1943; Stephen, 1945; and Eric, 1950.

After graduating from Winona, Suomi taught high school in Minnesota, was a meteorology instructor at the University of Chicago and, in 1945, became director of that university's meteorology department Instrument Laboratory.

In 1948 he was the first professor hired by Reid A. Bryson for the new University of Wisconsin-Madison meteorology department founded that same year by Bryson. Suomi served as department chairman from 1950-52 and again from 1954-57. He is presently a full professor of meteorology and is director of the Space Science and Engineering Center, which he organized in 1966.

In 1962 Suomi served a temporary appointment as Associate Program Director for Atmospheric Sciences in the National Science Foundation; soon afterwards, in 1964, he served as Chief Scientist of the U.S. Weather Bureau. He has been a member of numerous committees of the American Meteorological Society and was its president in 1968. He was the United States representative to the international Global Atmospheric Research Program's joint organizing committee in the late 1960s.

Suomi's research into global climate has included moisture measurements in the stratosphere, atmospheric turbulence, the invention of radiation sensing devices and a lightweight radio altimeter, and extensive investigations into the energy budgets of the Earth's surface. He directed the UW-Madison team which developed radiation experiments for Explorer VII and the TIROS-TOSS satellites, and invented the spin-scan cameras used aboard the ATS-1 and ATS-3 Earth synchronous satellites. The net flux radiometer carried by three of the Pioneer Venus probes was designed and built under his direction at UW-Madison and can be traced back to a 1954 net radiometer developed by Suomi as an inexpensive weather station tool.

In November 1977 he was awarded a 1976 National Medal of Science for his role as a teacher and for technological contributions to meteorology which have included the spin-scan satellite camera, flat-plate radiometer, pulsed radar balloon radio altimeter and the McIDAS computerized video display system. The presidential citation praised Suomi as "... a distinguished meteorologist (who) has provided a new view of the dynamics of our atmosphere which already has brought substantial benefits to the people of this nation and the world." It called him "a major driving force in the application of space systems for improved weather service to the public.'

His other awards include the Mesinger Award for aerological research achievement and the Carl-Gustof Rossby Research Medal, the American Meteorological Society's highest award. He has been elected a foreign member of the Finnish Academy of Sciences and the Deutsch Akademie der Naturfoscher, Leopoldina. He is a member of the U.S. National Academy of Engineering.

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1989

VERNER E. SUOMI

Education: Ph.D. 1953, University of Chicago, Chicago, Illinois
B.S. 1939, Winona Teachers' College, Winona, Minnesota

Professor Suomi taught in Minnesota high schools from 1938 through 1941. He joined the faculty of the University of Wisconsin in 1948. In 1966 Professor Suomi co-founded and became the first director of UW-Madison's Space Science and Engineering Center, retiring from that post in 1988. From 1948 through his retirement from teaching in 1986 Suomi held joint appointments in the College of Letters and Sciences (Meteorology), the College of Agriculture and Life Sciences (Soil Science), and the Institute for Environmental Studies. He served as Chairman of the Department of Meteorology from 1950 to 1952 and from 1954 to 1957. He is presently an Emeritus Professor. He also served as Director of the Cooperative Institute for Meteorological Satellite Studies (CIMSS) from its establishment in 1980 to mid-1984.

In 1962, Professor Suomi served a temporary appointment as Associate Program Director for Atmospheric Sciences in the National Science Foundation and served again with the government as Chief Scientist of the United States Weather Bureau in 1964. He has served on numerous committees of the American Meteorological Society and was its President in 1968.

From 1966 to 1970 he was chairman of the National Academy of Sciences' National Academy of Engineering Advisory Committee to Environmental Sciences Service Administration, and served as Vice Chairman of the National Academy of Sciences Committee on Atmospheric Sciences from July 1968 to September 1982. He is Chairman of the United States Committee for the Global Atmospheric Research Program (USC/GARP). He served as Chairman of the Climate Research Board from May 1979 through September 1982.

Professor Suomi has been the major driving force in the scientific community of the United States for application of space systems to improve weather service to the public. His impact on international meteorology has been enormous, as well, and people of all nations will benefit in the coming decades. He has distinguished himself through his service to science and engineering and has brought great credit to his country.

He studies nature with the efficiency of an engineer, yet with the subtlety and insight of a true scientist. He is a meteorologist who is a member of the U.S. Academy of Engineering. His is a unique and highly productive talent: He translates natural occurrences into quantitative measurements and information which society utilizes to comprehend the environment and to conduct its activities.

Professor Suomi's personal contribution to meteorology is of great importance, but it is quite likely that he has had an even greater impact through his profound influence on students and scientists within the range of his endeavors.

Professor Suomi was born on 6 December 1915 in Eveleth, Minnesota. He and Paula Meyer were married in 1941 and they have three children: Lois 1943, Stephen 1945, and Eric 1950.

Committee Activities

Chairman	USC/GARP
Member	Advisory Board, Geophysical Institute, University of Alaska
Member	UCAR Board of Trustees, and Trustee Liaison with UNIDATA Steering Committee
Member	UCAR Nominating, Executive, and Budget Committees
Member	Geophysics Film Committee (including PLANET EARTH)
Member	Nominating Committee, Academy of Arts and Sciences
Attends	National Academy of Sciences/Board of Atmospheric Sciences and Climate as Chairman, USC/GARP
Member	NASA Space and Earth Science Advisory Committee (SESAC) Task Force on the Scientific Uses of the Space Station
Member	Space Science Working Group
Chairman	JSC/CCCO Working Group on Satellite Observing Systems for Climate Research (International Council for Scientific Unions/World Meteorological Organization
Member	Space Applications Board Committee on Practical Applications of Remote Sensing from Space
Member	NOAA Panel on Climate and Global Change

Awards, Citations, and Special Recognition

1961	Meisinger Award presented for aerological research achievements	American Meteorological Society, Boston, MA
1965	Foreign Member Finnish Academy of Sciences	Finnish Acad. of Sciences, Helsinki, Finland
1966	Member National Academy of Engineering	NCR/NAE/NAS, Washington, DC
1968	Carl-Gustaf Rossby Award (Highest honor bestowed by AMS on atmospheric scientist)	American Meteorological Society (AMS), Boston, MA
1970	Foreign Member Deutsch Akademie der Naturforscher	Deutsch Akademie der Naturforscher, Leopoldina, Germany
1971	Robert M. Losey Award presented in recognition of outstanding contributions to the science of	AIAA, New York, NY

	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	
1971	Appointed one of first chairmen of National Advisory Committee on Ocean Atmosphere (NACOA) by President Richard Nixon	White House, Washington, DC
1975	Foreign Member	International Academy of Astronautics, Paris, France
1976	Elected Member	American Philosophical Society, Philadelphia
1977	Elected Fellow	Academy of Arts and Sciences, Boston, MA
1977	Harry Wexler Professorship of Meteorology	University of Wisconsin-Madison
1977	National Medal of Sciences. Presented by President James Carter in a White House ceremony 22 November 1977.	National Science Foundation, Washington, DC
1980	Charles Franklin Brooks Award. Presented for his many contributions of wisdom and leadership, both formal and informal, but especially as Councilor and President of the American Meteorological Society	AMS 60th Annual Meeting, Los Angeles, CA
1980	NASA's Exceptional Scientific Achievement Medal for his outstanding accomplishments and contributions to Pioneer Venus Project	Ames Research Center, Pioneer Honor Awards Ceremony, 28 February 1980
1980	Recipient of William T. Pecora Award Sponsored by Society of Exploration Geophysicists. Award given for outstanding	Sixth Annual Pecora Symposium and Exposition, Sioux Falls, SD

	application of remote sensing of the atmosphere	15 April 1980
1980	Honorary Membership, Wisconsin Academy of Science, Arts, and Letters. Given in recognition and appreciation for his many outstanding professional achievements	Annual Meeting, University of Wisconsin-Eau Claire 19 April 1980
1983	Honorary Degree of Doctor of Science given by State University of New York for his major role in ushering in a new age of global weather observations	University campus at Albany, New York at Commencement Exercise, 22 May
1984	Recipient of 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." The Franklin Medal, founded in 1914, is the highest award granted by the Franklin Institute.	17 January 1984 at the Franklin Institute, Philadelphia, Pennsylvania
1984	WARF (Wisconsin Alumni Research Foundation) Senior Distinguished Research Professor	10 February 1984
1985	One of 100 U.S. scientists to receive commemorative medal from Soviet Geophysical Committee for his contributions to the fulfillment of international programs in geophysics.	January 1985
1985	Received silver medallion from Malcom Baldridge, Secretary of Commerce, "For outstanding pioneering contributions critical to the development of US civil operational satellite systems and services."	1 April 1985 at NOAA 25th Anniversary of Weather Satellites at ceremony in National Air & Space Museum, Smithsonian Institute, Washington, DC
1985	Listed in <u>American Men & Women of Science</u>	1985 through Present

1986	Phi Kappa Phi National Scholar	12 August 1986 at Michigan State University
1986 1987 1988	Appeared in Who's Who in America	
1988	Honorary Member American Meteorological Society	30 March 1988
1988	Nevada Medal Desert Research Institute	October 5, 1988 Reno, Nevada

1. Flat Plate Radiometer (1957-60)

The flat plate radiometer was developed by Professor Suomi to measure the heat balance of the earth from a satellite. This information is necessary to understand the most basic of meteorological phenomena, the earth as a total heat engine. The flat plate radiometer is simple and essentially error free. Nonlinearities were removed in the design of the system; therefore, it can be calibrated by viewing the sun, space and earth in sequence from a spinning satellite. Despite sensor aging, accurate measurements were obtained by recalibration from first principles. This radiometer flew on the U.S. TIROS, ITOS and DMSP satellites. An earlier version was on Explorer VII, the first successful American meteorological satellite experiment. Through analysis of these observations, Suomi and his students established that radiative energy fluxes within the atmosphere varied markedly due to the effect of clouds and other absorbing constituents and that the earth was darker than originally believed because less solar energy was directly reflected to space. Prior to the development of the flat plate radiometer for satellite sensing, Suomi developed a series of radiometers to measure the radiation balance of the earth-atmospheric interface, the biosphere, and the free atmosphere. Knowledge of the radiative balance within man's geophysical environment enabled Suomi to pursue his work with satellites.

2. Global Atmospheric Research Program (1959 to Present)

Dr. Suomi, together with Drs. Charney, Smagorinsky, and Malone, originated the concept of the Global Atmospheric Research Program (GARP) in 1959. During the years that followed, Dr. Suomi, through his extensive contacts and close personal friendships with scientists in Russia, France, Scandinavia, Germany, India and Japan, extended and developed the concept into an international program.

GARP has been endorsed by three U.S. presidents as a major national commitment; it is sponsored by the World Meteorological Organization, and the International Council of Scientific Unions; every major nation has embraced the program and the smaller nations are also participating to the extent that they are able. GARP has already been enormously successful in its scientific, human, and political aspects. Scientists of all nations were brought together in a truly cooperative effort of benefit to all during the First GARP Global

Experiment (FGGE), the world's first truly global cooperative scientific effort.

Through FGGE in 1978-79, the capability to observe the atmosphere globally was achieved by the use of the spin-scan camera and geosynchronous satellites. This global data base in conjunction with improvements in numerical weather prediction has doubled the time for which a certain level of forecast accuracy is achieved. For example, the level of accuracy of prediction at two days from initial data prior to 1978 has now been extended to four days, while the current level of accuracy at two days was previously found at the one day mark. The program has also helped identify the global coverage and type of observations needed for successful specification and prediction of the atmospheric environment. Such advances in prediction and in basic understanding of the atmosphere could only have occurred through the development and application of a geosynchronous satellite capability.

The first of the many large scale experimental programs of GARP, the GARP Atlantic Tropical Experiment (GATE), began in 1974 with over 60 nations involved. Professor Verner Suomi, Chairman of the U.S. GARP Committee and member of the International Joint Organizing Committee, was deeply involved in GATE from beginning to end. It was an immensely successful field program, and Suomi richly deserves the gratitude and admiration of the international meteorological community.

After GATE and prior to the First GARP Global Experiment (FGGE), Suomi moved from the planning task of the U.S. GARP Committee to chair the FGGE Review Panel, organized to provide a scientific overview of the efforts of NASA, NOAA, universities and other agencies in preparing for FGGE. The importance of this task cannot be overstated. The success of the FGGE effort largely rested on Suomi, since the U.S. was the key to the entire program. Suomi was the man who led in deciding what must be done and who insisted that what was needed was done. Few, if any, positions of such enormous responsibility have ever been occupied by scientists.

3. Spin-Scan Camera (1963)

Professor Suomi's most noted contribution is his conception of and ceaseless efforts to implement the "Spin-Scan Camera" which has revolutionized satellite meteorology. This brilliant technical idea and the principles of the spin-scan camera now form the scientific foundation for geosynchronous satellite imagery for the operational weather services of the world. The system has been implemented in the GEOS series of meteorologocial spacecraft and currently supports both NOAA operations and broad-based meteorological research. This system now forms the basis for the world's largest international cooperative meteorological satellite undertaking, the worldwide geosynchronous meteorological satellite system, which has saved thousands of lives and millions of dollars from the ravages of storms. It has also made meteorological satellite data routinely available to many nations which could not otherwise have afforded it.

The spin-scan camera has made it possible to observe the same weather system at intervals of a few minutes. From these observations, it is possible to measure the dynamics of various phenomena, such as air motion, cloud height and growth rates, rainfall location and amounts, even the extent of dedicated to observing our geophysical environment. He applied the principles and technology that he had developed to sense within the earth's atmosphere to measure the flux of radiation within the Venusian atmosphere. To accomplish this task, he and his colleagues within the Space Science and Engineering Center designed and built an instrument for a space probe that successfully entered the Venusian atmosphere. From these and other measurements through the use of McIDAS, he and other colleagues demonstrated the existence of an intense vortex over each pole of Venus. Suomi continues in his studies of the planetary circulations through the use of McIDAS.

8. Other Qualifying Work

Professor Suomi has conducted numerous and diverse research programs both within SSEC and through extensive collaboration with investigators from other institutions. From his early work on global radiation budgets made using data from his own hand-made flat plate and hemispherical sensors which flew on the U.S. TIROS satellites to his current pioneering work on microwave antennas for the next generation of SSEC-founded atmospheric sounders, Professor Suomi has led the field in exploiting the capabilities of satellites. He directed the University of Wisconsin team which developed radiation experiments for EXPLORER VII and for the TIROS satellites. Professor Suomi served as a member of the Venus/Mercury 1973 Imaging Science Team and was heavily involved in developing an atmospheric temperature sounder (VAS) for the GOES. Data from this instrument make it possible to predict hurricane tracks much more accurately, aid in tornado forecasting, and is becoming basic input for numerical models. Dr. Suomi is a member of NASA's Mariner/Jupiter/ Saturn Imaging Science Team and was on the Pioneer Venus Science Steering Group. He is actively involved in determining our nation's future course through his committee work on the NASA Advisory Committee on Scientific Uses of Space Stations.

Professor Suomi is seen externally as a leading figure in international research circles, but to himself and to his University associates he is an educator above all else. He loves to teach undergraduates the beginning course in meteorology. When he does, it is an experience of unforgettable excitement and intense scholastic stimulation. Nevertheless, it is with graduate students and young scientists that Professor Suomi reveals his full talent as leader and instructor. It is not by accident that the University of Wisconsin-Madison has one of the largest undergraduate and graduate enrollments in its atmospheric sciences program of any university in the nation. The list of Professor Suomi's former students reads like a "Who's Who" of the younger generation of meteorologists. Professor Suomi's personal contributions are of great importance, but it is quite likely that he will have a far greater impact through his profound influence on his students, his profession, and the coming generation of scientists within the larger community who are involved in the observing and understanding of our global geophysical environment.

In a continuing effort to improve technology to achieve more rapid access to the spin-scan camera data, Professor Suomi has been the driving force behind the development and evolution of McIDAS (Man-computer Interactive Data Access System). McIDAS was initially conceived to produce accurate (to one meter per second) cloud motion measurements from ATS, SMS and GOES satellite data. The process presents conventional and meteorological satellite information on a television screen (CRT) for an operator who selects cloud elements upon which the computer performs the precise cloud motion measurements. Under Professor Suomi's leadership, the system has become a powerful data management and analysis system used for both meteorological research and operational weather forecasting. Efficient and rapid access to satellite image data allows meteorologists to obtain wind and other information over ocean areas (previously practically inaccessible) at low cost and on a regular operational basis. The wind information was the primary data base for the Global Atmospheric Research Program. Varieties of McIDAS are being used in the United States at the National Hurricane Center for operational hurricane forecasting, at the National Severe Storms Forecast Center for tornado forecasting, at the NASA Kennedy Space Center to provide Space Shuttle weather support and at other U.S. governmental agnecies, as well as the national meteorological centers of the Peoples Republic of China, Spain, Australia and Germany.

6. The VISSR Atmospheric Sounder (VAS) Experiment (1971 - Present)

The VISSR Atmospheric Sounder Experiment was proposed by Suomi to sound the atmosphere's temperature and water vapor distribution from a geostationary satellite. The requirement to sense the spectral distribution of radiation emitted by the atmosphere from a distance of 22,000 miles above the earth imposed extreme technological requirements due to the high spatial resolution and low levels of terrestrial energy received at such high altitudes within the instrument's small field of view. The system was designed to have high spatial reolution in order to observe the mesoscale features of the atmosphere (the scale at which severe weather occurs and evolves).

The successful performance of VAS was demonstrated shortly after its launch in 1980. Temporal and spatial variations of temperature and water vapor associated with severe convection and weather have been observed and retrieved with the anticipated accuracy set forth in Suomi's original 1971 proposal. These observations of the mesoscale weather are being used by the National Hurricane Center and the National Severe Storms Forecast Center for warning purposes. The information is also being used for numerical weather prediction and basic scientific studies of the atmosphere's mesoscale. The proposed National STORM Program being developed with the objective of improving both the observation and prediction of severe storms largely rests on the sensory capabilities of VAS. The high temporal and spatial resolution needed to observe the evolution of severe storms over a region of several hundred thousand square miles does not exist by any other means.

7. Planetary Space Research (1974 - Present)

Professor Suomi has been deeply involved with the exploration of Venus, Jupiter, and Saturn. Once Suomi successfully developed satellite experiments to measure our atmosphere's circulation, the application of this technology to space probes for planetary research was a natural extension for a scientist atmospheric pollution. Other satellite systems produce interesting aperiodic pictures, but the spin-scan camera data enabled evolutionary time sequence studies which described weather accurately and permitted the research necessary for operational applications. Satellite sensing has thus moved from qualitative viewing to quantitative measurement; from a research curiosity to an operational necessity.

The idea was first conceived while Suomi was serving as the first Chief Scientist for the National Weather Service. He wished to develop a system to take frequent observations of a single weather phenomenon to provide time-rate-of-change information about the weather. This capability could not be achieved from a low-orbit satellite. To see the earth continuously one must use a satellite in geostationary orbit, 22,000 miles away from earth. This distance presented severe design problems which Professor Suomi and Professor Robert Parent solved by using a spinning satellite for great inertial stability (100 revolutions per minute for an 800 pound satellite), high quality, yet small elements (10" diameter) in a scanning reflective telescope which sees only a very small portion of the earth at any instant. Professor Suomi used the spin of the satellite to scan the earth and create whole earth images at approximately thirty-minute intervals (2400 revolutions of the satellite are needed to produce one complete image of earth; each spin views a narrow strip on the ground).

This camera was flown first on two satellites of the Applications Technology Satellite series (ATS I and III). These two satellites provided the longest period of continuous operation at or near design potential of any satellites ever flown. The spin-scan camera provided eight years of high quality, accurate images of the earth's atmosphere and formed the design basis for the present operational system called the Synchronous Meteorological Satellite (SMS) by NASA and the Geosynchronous Operational Environmental Satellite (GOES) by NOAA. It has also been adopted by the European Space Agency, the Japanese Meteorological Satellite Service, and the Indian Meteorological Department for their operational meteorological satellite programs.

4. Balloon-Borne Radioaltimeter (1968)

Professor Suomi and one of his graduate students, Nadav Levanon, developed a device to measure the height of meteorological balloons with great accuracy. The tiny radioaltimeter is a pulsed radar system in which the elapsed time period between transmitted pulses is a measure of altitude. This invention, which weighs only grams, measures the height of a balloon at 70,000 feet to + 2 feet accuracy! In 1975 more than 350 constant level balloons were equipped with the radio-altimeter and a very accurate pressure sensor and were released in the tropics and the southern hemisphere. The balloons transmitted data to the Nimbus-F satellite which, in turn, reported the information to a NASA ground station. These data have provided the first global trajectories of air motions in the Southern Hemisphere and was important for the development of numerical models of the circumpolarc circulation of the Southern Hemisphere.

5. McIDAS (April 1972 - Present)

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

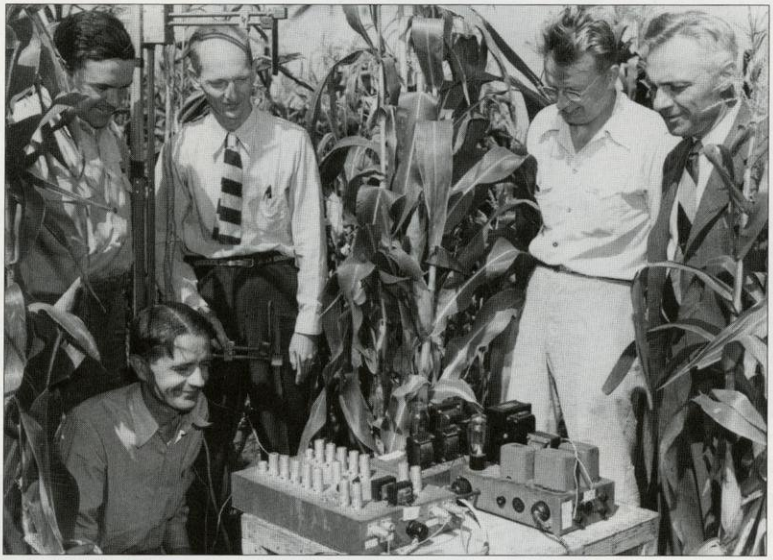
Contents of this memorial volume to Verner E. Suomi were compiled from records at the Space Science and Engineering Center, where Professor Suomi was based for most of his 40-year professional life. We have included his publications, committee work and honors he received. We have also excerpted tributes 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

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

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 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.)

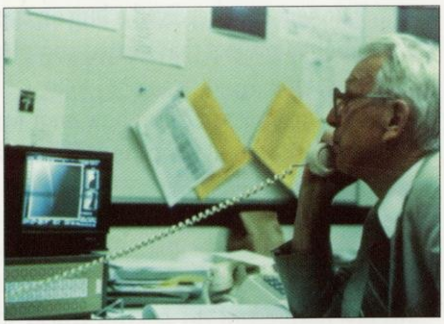
John P. Roberts, Assistant Director

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.

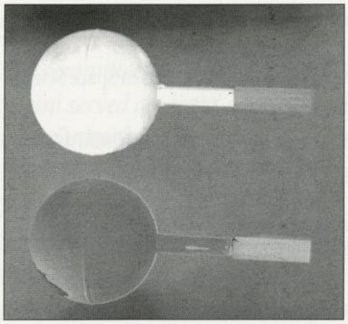
The Man-computer Interactive Data Access System (McIDAS), like so many of his ideas, just popped into his head. As he watched a football game on television, he realized that what he really wanted was an "instant replay of weather pictures." He wanted to slow them down, replay them, and have a computer 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.

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—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.

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

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—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.

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—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).

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Professors Suomi and Parent pose with Explorer VII satellite. The black ball is part of their heat budget experiment.

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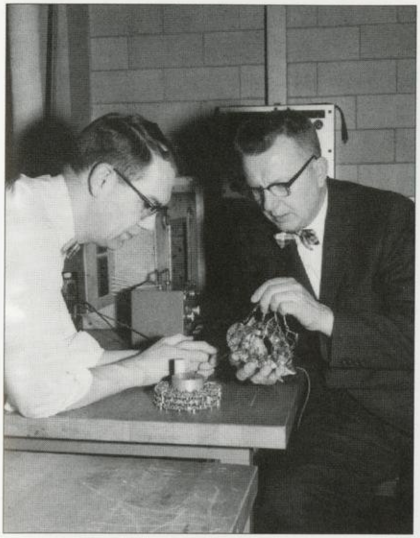

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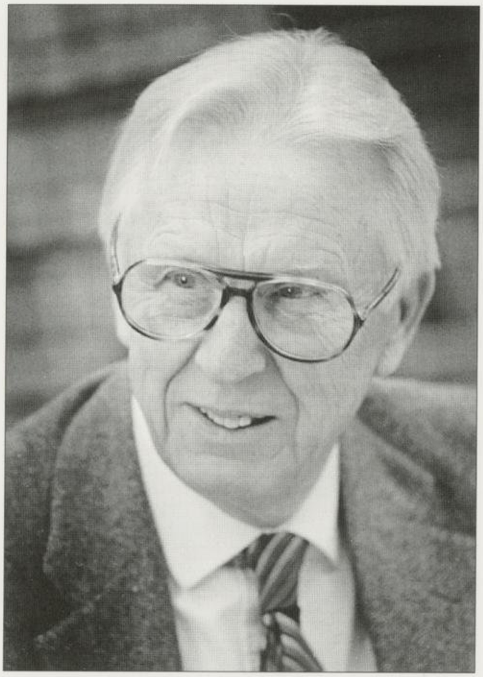

I often say, rock the boat.
But before you rock it, do three things:
measure the freeboard on the boat,
notice the state of the sea,
and the distance to shore.
Only then rock the boat.

Verner E. Suomi, 1988

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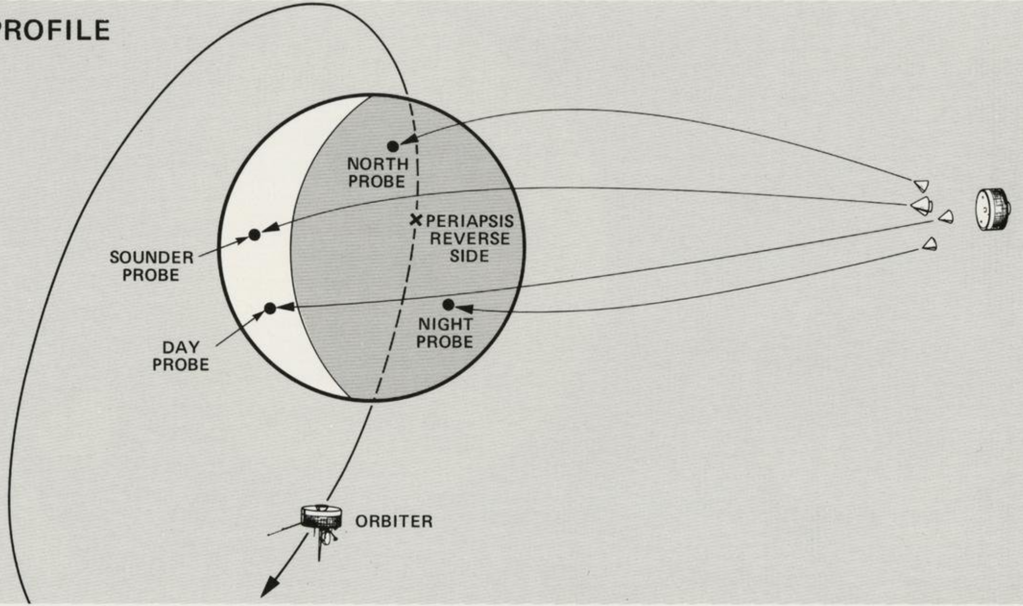
PIONEER VENUS

MISSIONS PROFILE



THE PIONEER VENUS MISSIONS

NASA is sending an orbiter and five atmosphere entry spacecraft to Venus in 1978 to conduct a detailed scientific examination of the planet's atmosphere and weather. The information they gather may help us learn more about the forces that drive the weather on our own planet.

The mission also will survey large areas of Venus' surface for the first time for craters and mountains, and will map Venus' gravity field to calculate the density distribution of the planet's interior, plus its global shape.

The Orbiter is launched in May and inserted into Venusian orbit in December of 1978; the Multiprobe spacecraft is launched in August and its probe craft will enter the Venusian atmosphere five days after arrival of the Orbiter.

The spin-stabilized Multiprobe spacecraft consists of the Bus, the large Sounder Probe, and the three identical North, Day and Night Probes, each carrying a complement of scientific instruments. The probes will be released from the Bus 20 days prior to arrival at Venus.

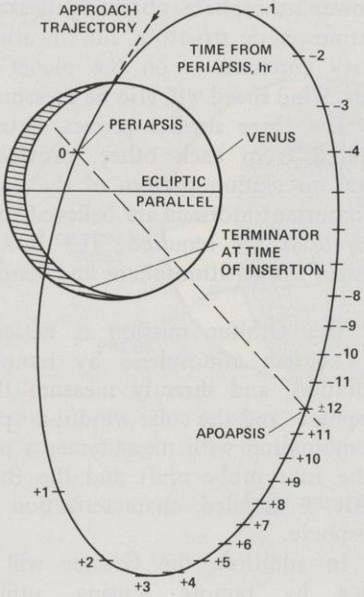
The Sounder Probe conducts a detailed sounding of the lower atmosphere, obtaining measurements of the clouds, the atmospheric structure, and the atmospheric composition. Primary emphasis is on the planet's energy balance and clouds. Wind speed will also be measured during the descent.

The three smaller probes, entering at points widely separated from each other, provide information on the general circulation pattern of the lower atmosphere. Since the important motions are believed to be global, only a few observations are required. The Bus provides data on the Venusian upper atmosphere and ionosphere before burning up.

The Orbiter mission is designed to globally map the Venusian atmosphere by remote sensing and radio occultation, and directly measure the upper atmosphere, ionosphere, and the solar wind/ionosphere interaction. Thus, in combination with measurements made at lower altitudes by the four probe craft and the Bus, Pioneer Venus will provide a detailed characterization of the entire Venus atmosphere.

In addition, the Orbiter will study the planetary surface by remote sensing, utilizing radar mapping

ORBIT DESIGN



techniques. This should provide important information on Venus cratering and surface structure.

The Orbiter will be placed in a highly inclined elliptical orbit with the lowest point in Venusian mid-northern latitudes at about 150 km (90 mi) altitude. Operation in orbit should allow investigation over at least one complete rotation of Venus on its axis (243 Earth days).

Pioneer Venus is the first United States mission developed specifically to investigate directly the atmosphere of Venus on a planetary scale. The two spacecraft arrive at Venus in early December of 1978. To accomplish this timing, the Orbiter is launched on a trajectory which takes it more than 180 degrees around the solar system in seven months. The probe vehicle's trajectory is a direct path from the Earth to Venus requiring only four months.

The Orbiter weighs 582 kilograms (1280 pounds) and carries 43 kg (95 pounds) of instruments.

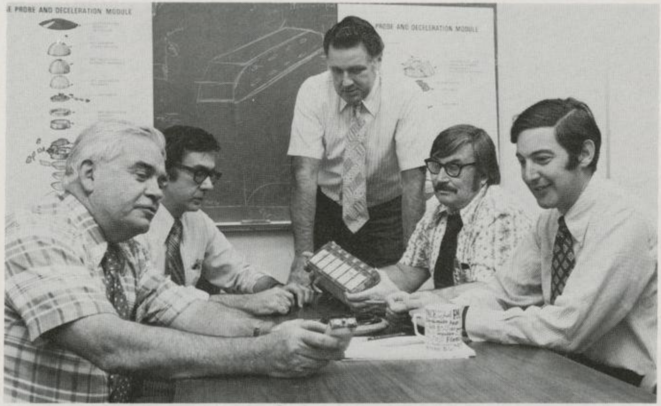
The Multiprobe splits into five atmosphere entry craft (the Bus and the four Probes) eight million miles from Venus. There the vehicles are targeted to locations which are spread over the planet's entire Earth-facing hemisphere.

During their 57-minute descent through the atmosphere, the four probes will provide valuable information on winds and circulation patterns. The probes are not designed to survive after impact.

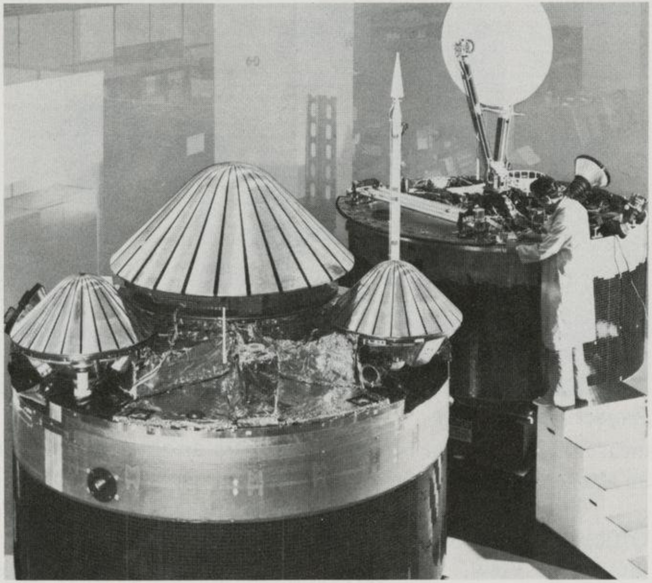
The Sounder Probe carries about 28 kg (62 lbs) of instrumentation as part of its 291 kg (642 lb) bulk. Its payload includes a mass spectrometer and a gas chromatograph to provide details about the identity of components in the atmosphere.

The three smaller Probes weigh about 86 kg (189 lbs) each, including 2.7 kg (6 lbs) of scientific instruments. The probes' heat shields and pressure vessels comprise most of the weight. The probes will measure atmospheric pressure and temperature. A nephelometer will measure cloud extent and altitude and look at changes in cloud densities. A net flux radiometer will also be on board to investigate the exchange of heat energy between the Sun and the atmosphere.

The Bus will also carry a mass spectrometer for studies of the upper atmosphere. After the probe release, the Bus will be targeted for a shallow atmospheric entry, obtaining measurements of the upper atmosphere until it burns up at an altitude of about 120 km (75 mi).


Project Management

The Pioneer Venus mission is managed for NASA's Office of Space Science by NASA's Ames Research Center, Mountain View, Calif. Spacecraft are built by Hughes Aircraft Company, El Segundo, Calif.



Multiprobe and Orbiter at Hughes Aircraft

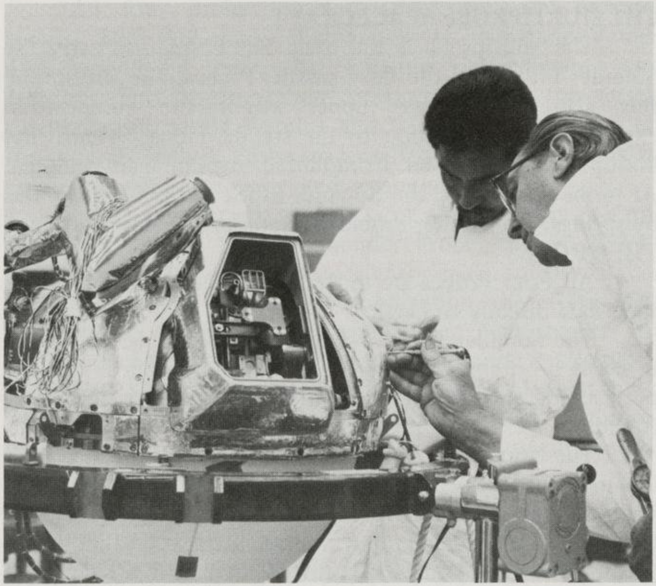
THE VENUS SPACECRAFT

THE BUSES

The Pioneer Venus Orbiter and Venus Multiprobe spacecraft share a "basic Bus" design. The Bus portions of each are identical spin-stabilized cylinders containing most spacecraft systems.

Three-quarters of the systems on the basic Bus are common to both spacecraft. These include a thermally-controlled equipment and scientific instruments compartment, solar panels around the Bus exterior, batteries and power distribution system, forward and aft omni antennas, communications systems, data processing systems, and Sun and star sensors for orientation reference. Other common systems are hydrazine propellant tanks plus six thrusters for orientation, course corrections, and spin rate control.

A spin-rate of 15 revolutions per minute maintains the spin axis of both craft perpendicular to the Earth's orbit plane during cruise. This orientation keeps solar cells at right angles to the Sun's rays, for maximum power output. In Venus orbit, the Orbiter spin rate is cut to five RPM, but



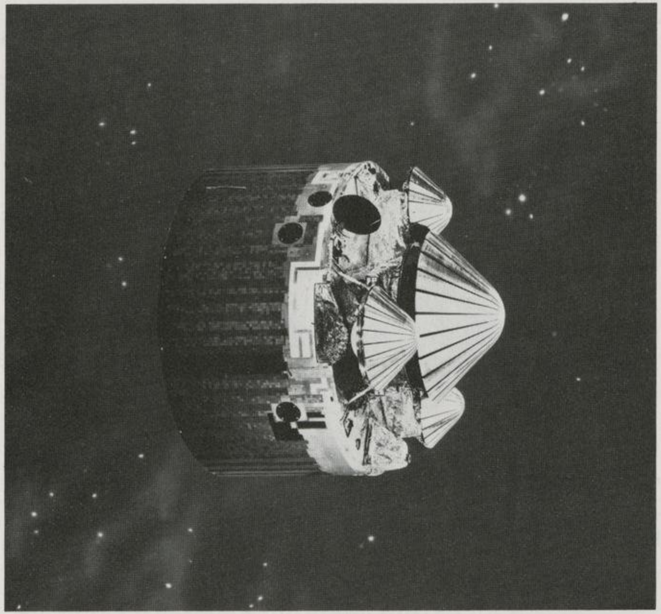
Probe Craft Assembly

it continues the same perpendicular orientation.

Both Orbiter and Multiprobe Buses carry S-band radio receivers and transmitters for two-way Doppler tracking, command receipt and data transmission, plus a command memory for 256 commands. Both Buses transmit data at a rate of 2048 to 16 bits per second (BPS).

Navigation for both spacecraft employs the Doppler shift in frequency of spacecraft radio signals. The shift is caused by motion of the spacecraft and measured by ground tracking. It allows computer calculation of speed, distance, and location of the spacecraft.

Both cylindrical spacecraft are about 2.5 meters (8.3 feet) in diameter. The Venus Orbiter, including its high-gain antenna array, is almost 4.5 m (15 ft) high. The Venus Multiprobe is 2.2 m (7.5 ft) high. Launch weight of the Orbiter is about 582 kg (1280 lbs) with 45 kg (100 lbs) of scientific instruments. Weight after orbital insertion is 368 kg (810 lbs). Weight of the Multiprobe is 904 kg (1990 lbs) with 49 kg (108 lbs) of scientific instruments.



THE MULTIPROBE SPACECRAFT

The Multiprobe is the basic Bus adapted to carry the Sounder Probe and the three smaller Probes. The Multiprobe Bus also carries two upper atmosphere composition experiments. In addition to the standard Bus systems, the Multiprobe Bus has an aft-mounted, medium-gain antenna. At probe separation, the Sounder Probe ejects from the Bus by springs. The smaller Probes are spun off by Bus rotation.

THE PROBES

All Four Probes are individual spacecraft, and transmit their data directly to Earth.

The Sounder Probe weighs about 314 kg (691 lbs) and is about 1.4 m (4.7 ft) in diameter. It returns data at 256 bits per second, and its seven scientific instruments weigh 29 kg (64 lbs).

The North, Day, and Night Probes are identical. Each is 0.8 m (30 inches) in diameter and weighs 90 kg (200 lbs). Each carries three scientific instruments, weighing 3.5 kg (7.7 lbs). The smaller Probes transmit data at 64 BPS during flight down to 30 km (18 mi) altitude and 16 BPS from there to the surface.

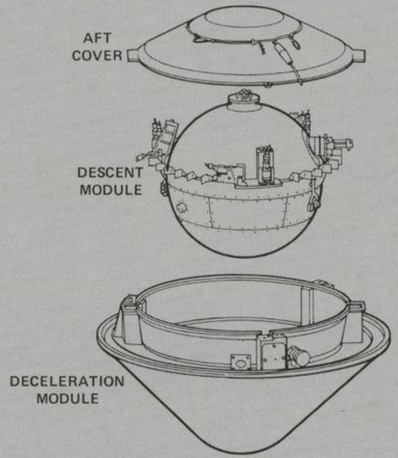
All four probes employ sealed spherical pressure vessels. They are made of titanium, to withstand Venus' 480°C (900°F) heat, its corrosive atmosphere, and 100-times-Earth's atmosphere pressure. Inside, the vessels carry the spacecraft systems and scientific instruments on fore and aft shelves. Probe spacecraft systems include power, command, data processing, and communications.

Entry forces peak at 315 G at about 78 km (48 mi) above the surface for the Sounder Probe, and at 200 to 560 G, depending on atmosphere entry angle, for the smaller Probes. For entry heating and stabilization, the probes have blunt-nosed, 45° conical carbon-phenolic heat shields. Aft bodies are coated with heat-resistant elastomeric coatings.

The Sounder Probe is slowed during descent by a parachute, and jettisons its heat shield after entry. The three smaller Probes carry their heat shields to Venus' surface. All four are spin-stabilized for entry.

All instruments on all four probes require either observing or sampling access to the hostile Venus atmosphere. This access is one of the hardest problems of the mission. The Sounder Probe has 15 sealed windows or other

THE SOUNDER PROBE



pressure vessel penetrations, the smaller Probes, eight. There are 14 sapphire and one diamond windows.

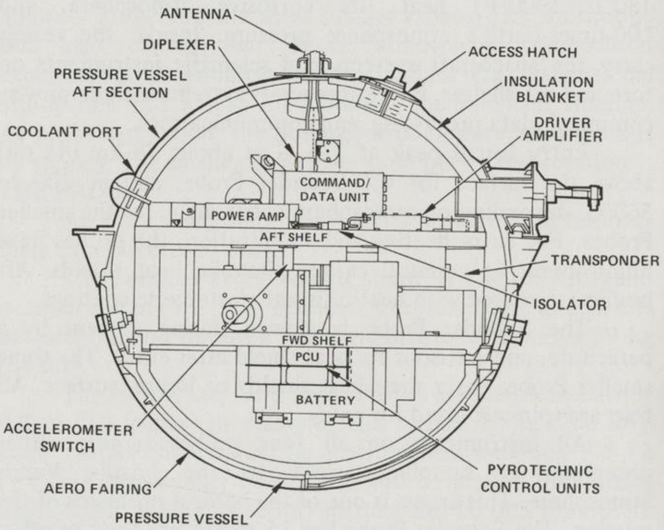
Each probe is powered by a 28-volt silver-zinc battery. The Sounder Probe battery has four times the capacity of each smaller Probe battery.

Command systems on the four probes consist of on-board logic and automatic timing and sensing devices which can provide up to 64 commands, as needed. The probes cannot be commanded from Earth after separation from the Bus.

Each of the four probes communicates directly with Deep Space Network antennas using solid state transmitters and hemispherical-pattern antennas.

Probe data-handling systems can accept data from scientific instruments and engineering systems on 72 channels, and can store 3,072 data bits. The Sounder Probe has a more powerful radio transmitter than those for the smaller Probes, to handle its higher data rate. It also carries a radio receiver, for two-way Doppler tracking only. Reference frequency for one-way Doppler tracking of the smaller Probes is provided by stable oscillators.

SOUNDER PROBE PRESSURE VESSEL

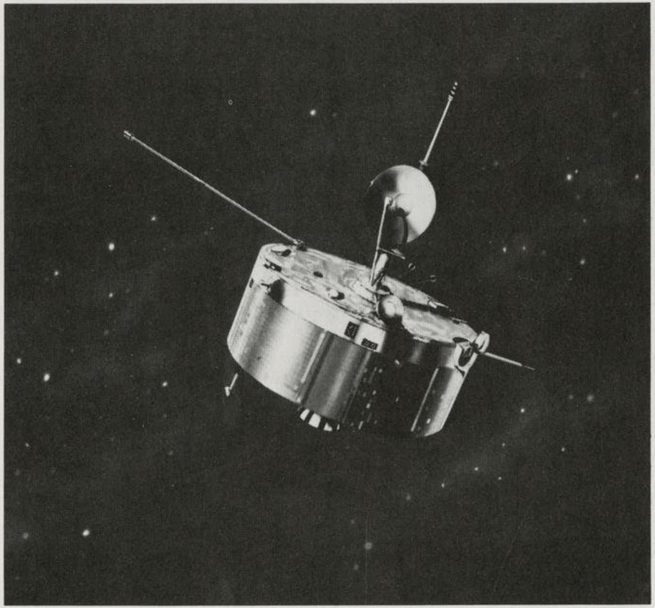


VENUS ORBITER

The Orbiter consists of the basic Bus adapted to the Orbiter mission.

At the forward end of the spacecraft, the Orbiter's high-gain, parabolic dish antenna is mounted on a ten-foot mast, aligned with the spin axis. A bearing and power transfer assembly mechanically despins the antenna. With the spacecraft spin-stabilized perpendicular to the Earth's orbit plane, the antenna reflector can focus constantly on Earth during both interplanetary cruise and on orbit.

The Orbiter's 12 scientific instruments are carried inside the spacecraft's equipment compartment. Two magnetometer sensors are mounted on a 4.7 m (15.5 ft) boom to prevent magnetic interference from the spacecraft.

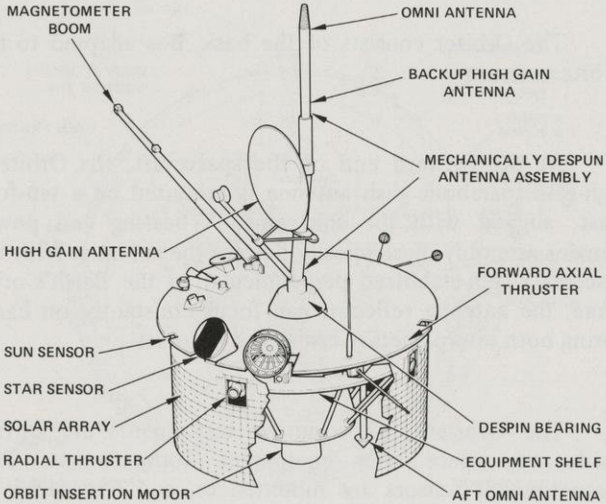


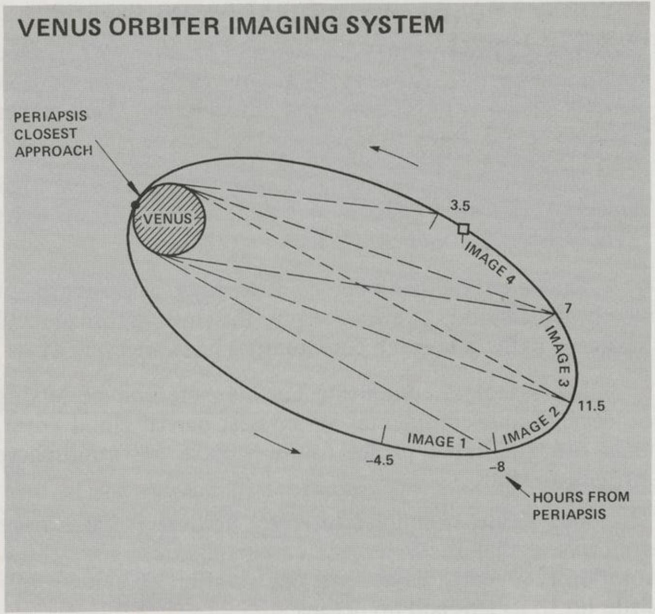
In addition to its basic Bus S-band transmitter, the Orbiter also has an X-band transmitter. This allows study of Venus atmosphere effects on the radio signal at two different frequencies during planet occultations. An 18,000 Newton (4000 lb) thrust rocket motor on the aft end of the spacecraft puts the Orbiter in planet orbit.

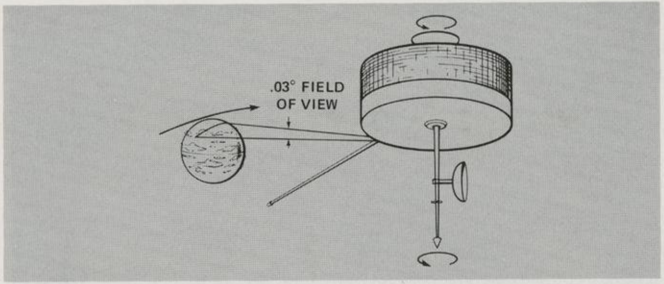
Like the Multiprobe, the Orbiter has two 250 watt-hours nickel-cadmium batteries. It has a slightly larger solar array than the Multiprobe, 7.4 square m (79.6 sq ft), to meet its larger power demands. The array provides 312 watts at Venus.

The Orbiter also has a data storage unit with a one-million-data-bit memory to store for later playback to Earth. Data storage will be especially important during communications blackout periods of up to 26 minutes when the spacecraft is behind Venus.

ORBITER SYSTEMS

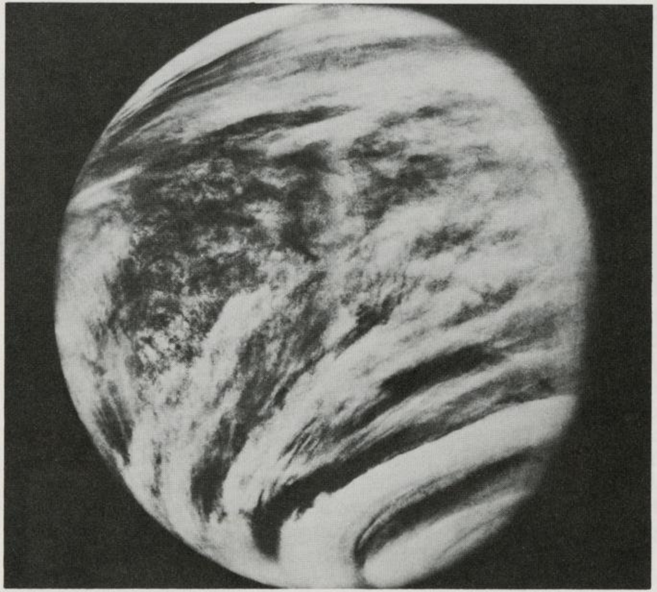






The cloud photopolarimeter uses the motion along the Oribiter's flight path around Venus for complete mapping of the planet. The instrument uses a 3.7 cm (1.5 in.) telescope with an ultraviolet (UV) filter for tracking the four-day rotation of Venus' clouds, shown by UV-absorbing markings in the dense upper atmosphere. The instrument can make five planetary images in each spacecraft orbit. The field of view is about one-half milliradian, corresponding to a resolution of about 30 km (19 miles) directly below the Orbiter. The instrument will also measure scattered sunlight polarization based on cloud and haze particle size, shape and density.

When the Orbiter is at periapsis the instrument observes in visible light the high-haze layers of the atmosphere. These "limb scans" have a resolution as small as 0.5 km (0.3 miles).



Venus Cloud Circulation

WHY PIONEER VENUS?

Venus Holds Clues to Earth's Weather. When two Pioneer spacecraft arrive at Venus in 1978 to probe that planet's murky atmosphere, the information they gather may also help us learn more about planet Earth.

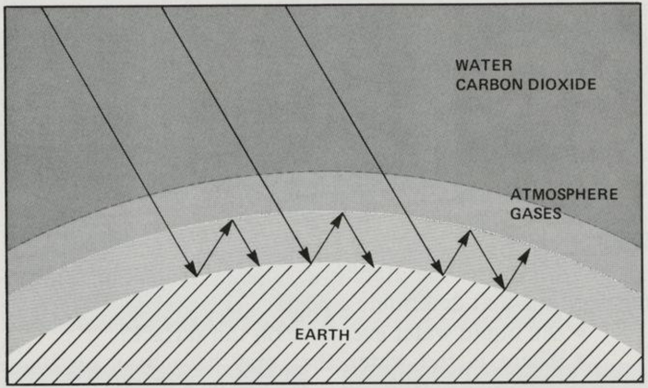
NASA believes the study of weather patterns on other planets – and on Venus in particular – can provide clues to the mysteries of our own weather system.

On Earth, the basic causes of weather patterns are not clearly understood, as evidenced by the shifting tornado and hurricane paths that catch communities unaware every year.

Many factors complicate Earth's meteorology. Mixing of oceanic and continental air masses, partial cloud cover, axial tilt, and rapid planet rotation make our atmosphere difficult to study.

But Venus is simpler to study because it has a basic atmosphere that is 95 percent carbon dioxide, a very slow rotation (243 Earth days equal one rotation of Venus), very little tilt to its axis and no oceans.

GREENHOUSE EFFECT TRAPS SOLAR ENERGY



The "runaway greenhouse" theory argues that Venus' atmosphere allows some sunlight to reach the planet's surface but stops most of the outgoing heat radiation. The thick cloud layers and carbon dioxide atmosphere block surface heat from radiating back into space, creating 485 degree C (900 degree F) surface temperatures. Some scientists warn that as we burn vast amounts of fossil fuels we increase CO2 levels in the Earth's atmosphere, and may be creating a runaway greenhouse like that on Venus.

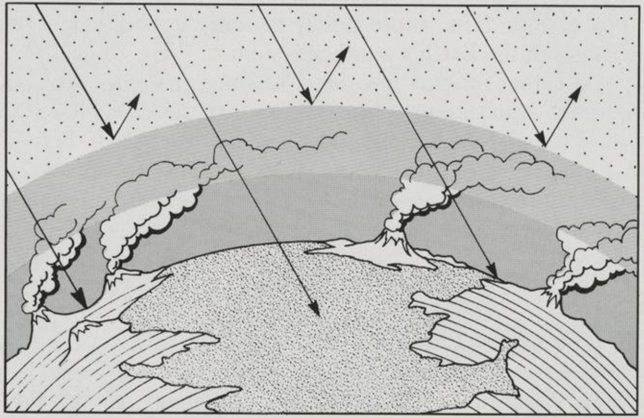
If scientists can understand how these variables affect the atmosphere of our closest planetary neighbor, they hope to be able to define more clearly the impact of the numerous variables in the Earth's weather system.

Further insights into basic weather processes will come not only from intensive observations of the Earth itself but also through NASA's current first-hand studies of Jupiter's fast-spinning atmosphere and Mars' easily-observed, largely cloudless atmosphere which is sometimes rendered so opaque by very large dust storms that the surface can no longer be seen.

Questions Important to Man. Comparison of Venus' atmospheric characteristics with those of Earth may help answer other important scientific questions. Among these are:

• Why has Venus taken a different evolutionary path than Earth? Venus is similar to Earth in size and mass, and was probably formed out of the same homogeneous mixture of gas and dust. It has often been called Earth's sister planet.

LITTLE ICE AGE
1450-1615



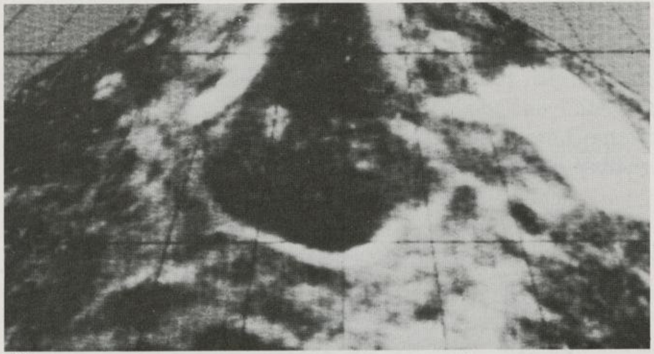
The "Little Ice Age" on Earth saw a dramatic cooling of the Earth's climate. England's Thames River froze over, European villages were overrun by glaciers and no ships could reach Greenland, which had been colonized centuries before. Many scientists believe the large number of volcanic eruptions in this period were largely responsible for the planet-wide cooling. Volcanoes spew into the atmosphere great quantities of dust which turn into tiny sulfuric acid particles. These reflect sunlight away from the Earth's surface, causing it to cool. The pale yellowish clouds which obscure the surface of Venus are thought to consist of virtually identical sulfuric acid droplets. Studying Venus' clouds may help us better understand the role these droplets play in Earth's weather.

But recent American and Soviet space probes have revealed atmospheric and surface conditions that differ markedly. The surface of Venus is sizzling hot at 480°C (900°F), the atmosphere about 100 times heavier than that of Earth, and largely made up of carbon dioxide.

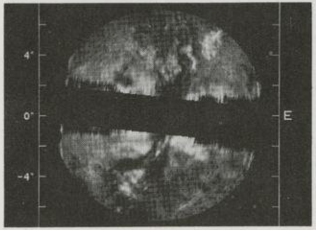
The processes that resulted in such unusual conditions are difficult to explain. Scientifically, Venus is the most puzzling planet in the solar system.

Other important questions that Pioneer Venus may help answer are:

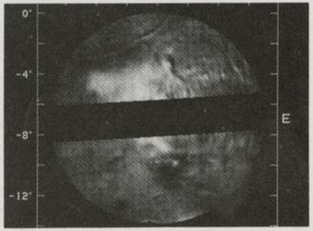
- What are the stabilizing and destabilizing feedback mechanisms that determine a planet's climate?
- Did liquid water ever flow on the surface?
- Where is the water that may have been on Venus originally?



(A)



(B)



(C)

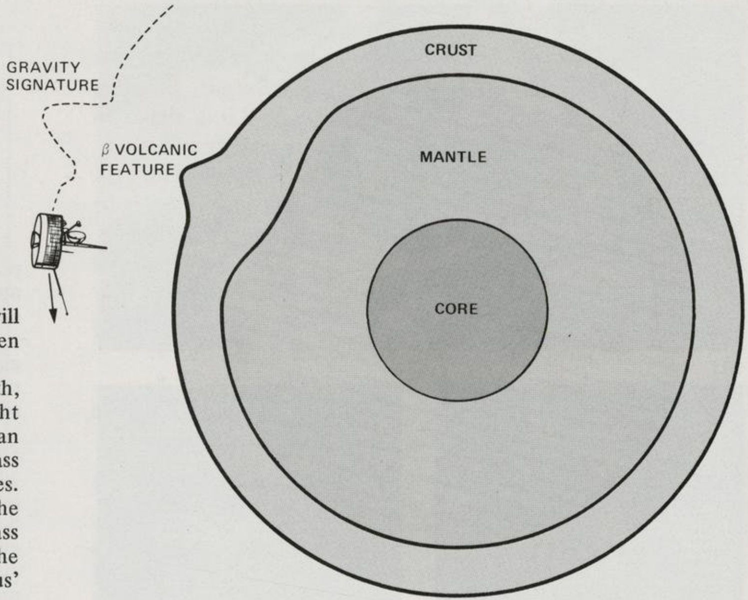
While it is not possible to see through the clouds of Venus, powerful Earth-based radar can easily penetrate to the surface. Radar maps of Venus reveal features interpreted as extensive lava flows, canyons, major chasms and large shallow craters.

(A) A 1976 radar probing reveals a bright area thought to be a gigantic lava flow and a dark area which may be a large impact basin similar to those on the moon. The basin, the size of Hudson Bay, is surrounded by sharp ridges several hundred kilometers long.

(B) This high resolution radar image shows a dark chasm over 1000 km (620 miles) long running north-south across the equator. It appears to be 1-2 km (0.6-1.2 miles) deep and branches into two at its southern end. The main trough is roughly 150 km (95 miles) wide.

(C) This picture shows craters 35 km to 100 km (22 to 62 miles) in diameter. All are shallow, i.e., the ratio of crater diameter to depth is about 100 to 1, compared to the Moon's 10 to 1.

In photos (B) and (C), numbers show Venusian latitudes.



The Orbiter's internal density distribution experiment will determine the planet's global shape and the relationship between Venus' surface features and their corresponding internal densities.

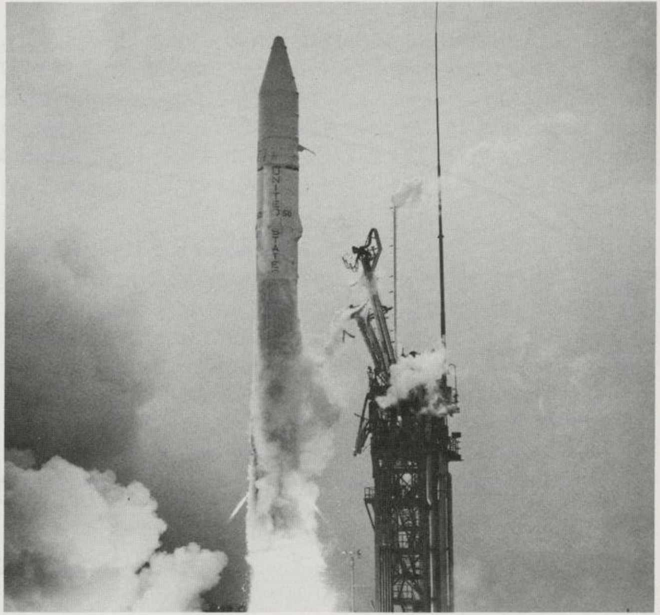
The experiment will use radio signals sent first from Earth, received by the Orbiter, and retransmitted back to Earth. Slight Doppler shifts in frequency of these retransmitted signals mean velocity changes due to "gravity signatures" caused by mass concentrations, perhaps prominent surface features such as volcanoes.

Analysis of these velocity changes will allow mapping of the planet's gravity field providing information on the internal mass distribution of Venus, the likely composition and temperature of the interior, and possible physical processes which governed Venus' planetary evolution.

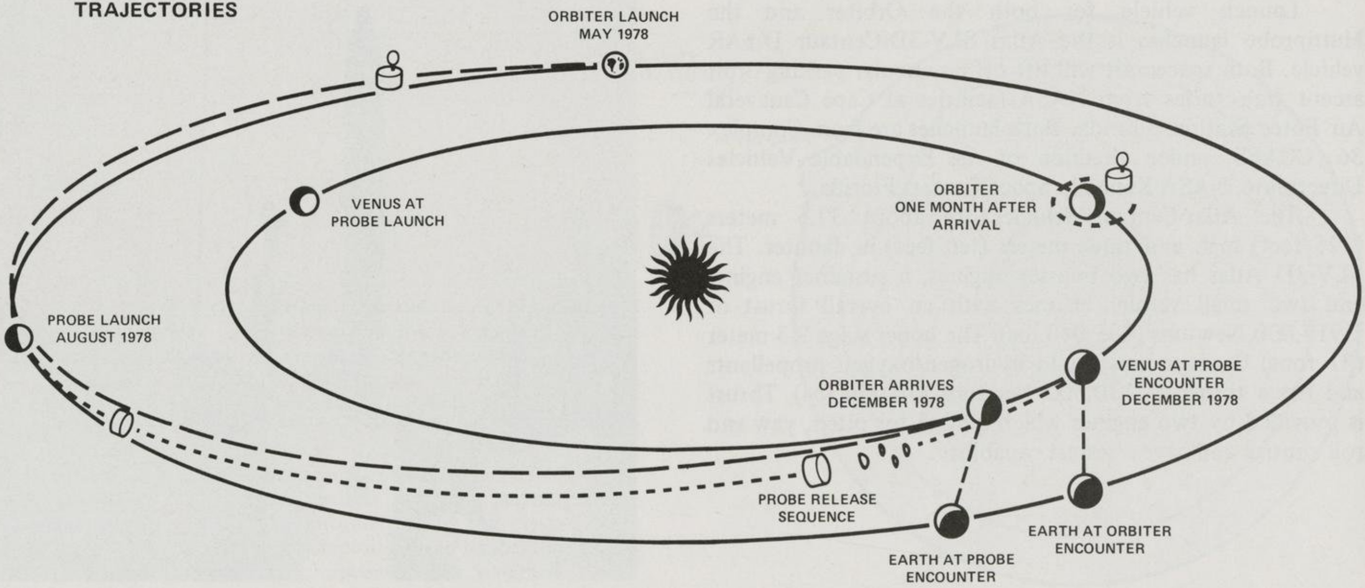
THE LAUNCH VEHICLES

Launch vehicle for both the Orbiter and the Multiprobe launches is the Atlas SLV-3D/Centaur D-1AR vehicle. Both spacecraft will lift off on circular parking-orbit ascent trajectories from NASA facilities at Cape Canaveral Air Force Station, Florida. Both launches are from Complex 36, CCAFS, under direction of the Expendable Vehicles Directorate, NASA Kennedy Space Center, Florida.

The Atlas-Centaur vehicles are about 37.5 meters (125 feet) high and three meters (ten feet) in diamter. The SLV-3D Atlas has two booster engines, a sustainer engine, and two small vernier engines with an overall thrust of 1,917,000 Newtons (431,040 lbs). The upper stage 9.3 meter (31 foot) Centaur uses liquid hydrogen/oxygen propellants and has a thrust of 130,000 Newtons (30,000 lbs). Thrust is provided by two engines which gimbal for pitch, yaw and roll control and have a restart capability.



PIONEER VENUS TRAJECTORIES



MISSION EVENTS AND OPERATIONS

At Venus, the primary Orbiter mission lasts 243 Earth days, one Venus rotation on its axis, while the four Probes measure Venus' atmosphere from top to bottom in just 57 minutes each.

ORBITER EVENTS

Orbiter events en route to Venus include launch, spin-up to 15 RPM, one course correction during the first month, checkout for orbit insertion, spacecraft reorientation, and rocket burn for orbit capture. In orbit, spin rate is cut to five RPM, and thrusts for orbit trim will be commanded every two weeks.

Both during cruise and in orbit, radio commands every few days adjust the pointing of the despun, parabolic high-gain antenna to keep the radio beam centered on Earth.

The Orbiter's highly inclined (75°) elliptical orbit allows radar mapping of one north-south strip of Venus' surface per day from about 50° north of the equator to 6° south. During the primary Orbiter mission at Venus of 243 days, it will map a belt completely around the planet. The orbit has a 24-hour period for timing orbital events with Earth events, and for returning periapsis data when two 64-meter antennas see the spacecraft at the same time. Orbital high point is 67,000 km (41,500 mi); low point (periapsis) is 150 km (90 mi).

MULTIPROBE EVENTS

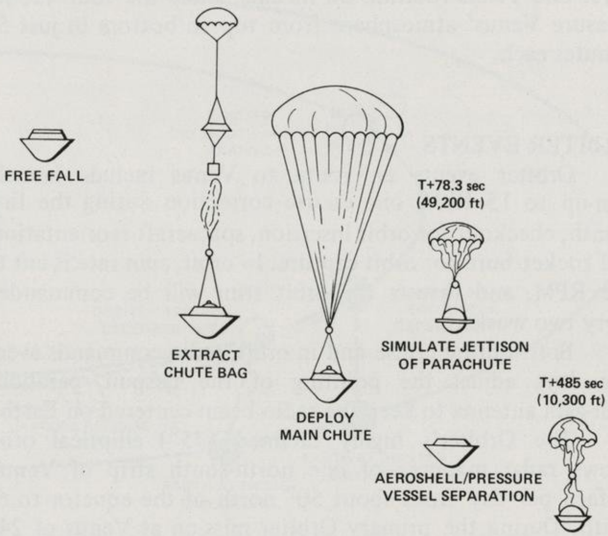
The probes separate from the Multiprobe Bus 20 days before planet arrival, fly independently to their target points, and are not heard from again until 20 minutes before atmosphere entry. Entry speeds are around 41,600 km/hour (26,000 mph). One of the three smaller Probes enters at 58° north latitude on the night side. This may be far enough north to reach the polar vortex where upraised equatorial air is believed to spiral down to Venus' surface again. The

Multiprobe Bus enters at about 45° south latitude at a shallow angle of about 10°, and makes its measurements down to an altitude of 120 km in about two minutes before it starts to burn up. Only the Bus makes atmospheric and ionospheric composition measurements in the 120 to 150 km altitude region.

Earth-Venus cruise events for the Multiprobe include the following: launch, spin-up to 15 RPM, one or two course corrections in the first 30 days, reorientation for use of aft medium-gain antenna, and checkout of instruments on all four Probes and Bus. Other events are aim and launch Sounder Probe at about 13 million km (8 million mi) from Venus; retarget, spin up to 48 RPM, aim, and release North, Day, and Night Probes; retarget, spin down to 15 RPM, and orient for Bus entry.

After separation of the four Probes, all probe commands come from on-board electronics. Two hours before entry, on-board commands activate batteries and warm up probe radios. At 22 minutes before entry, scientific instruments are warmed up and calibrated; high speed entry occurs at about 26,000 mph, with about a ten-second

DEPLOYMENT AND SEPARATION SEQUENCE

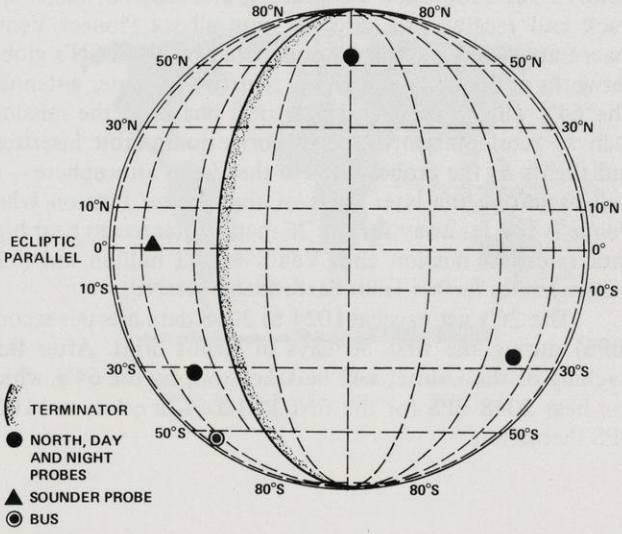


communications blackout, during which data is stored. After entry, instrument booms on the smaller Probes deploy and instruments begin measurements. At 30 km altitude, data rate of the smaller Probes change to 16 BPS. At 56 minutes after atmosphere entry, all four Probes impact on Venus' surface. Some seismic and other data may be returned from the surface, though probes are not designed to survive there.

Sounder Probe events after entry include parachute deployment (smaller Probes have no chutes), and heat shield jettison at 67 km (42 mi), parachute jettison at 47 km (26 mi), and impact on Venus' surface at 32 kph (20 mph) 57 minutes after entry.

The Bus enters, measures upper atmosphere and ionosphere, and burns up 90 minutes after the last probe enters.

VIEW FROM EARTH OF PROBE ENTRY LOCATIONS

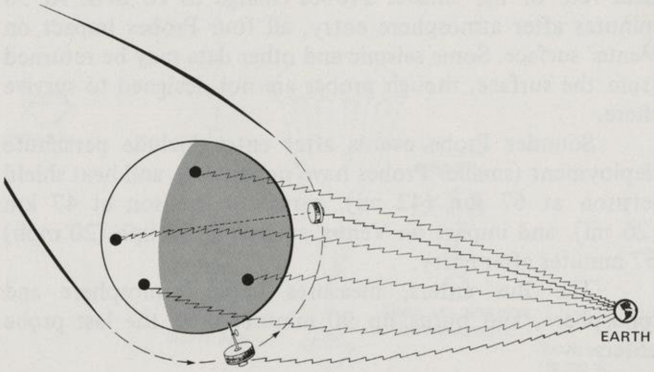


DATA RETURN, COMMAND, AND TRACKING

NASA's Deep Space Network (DSN), operated by NASA's Jet Propulsion Laboratory in Pasadena, Calif. will track and receive data directly from all six Pioneer Venus spacecraft. Tracking will be conducted by the DSN's global networks of 26-meter and highly sensitive 64-meter antennas. The 64's will be used during critical phases of the mission, such as reorientation, velocity corrections, orbit insertion, and flights of the probes through the Venus atmosphere – as well as during the later parts of the Orbiter mission when Venus is too far away for the 26-meter antennas to hear high data rates. At mission end, Venus is 203 million km (126 million) miles farther from Earth than at arrival.

The 26's will receive 1024 to 2048 data bits per second (BPS) during the first 50 days in Venus orbit. After this, tracking of the Orbiter will be taken over by the 64's, which can hear 2048 BPS for the first 130 days in orbit, and 1024 BPS thereafter.

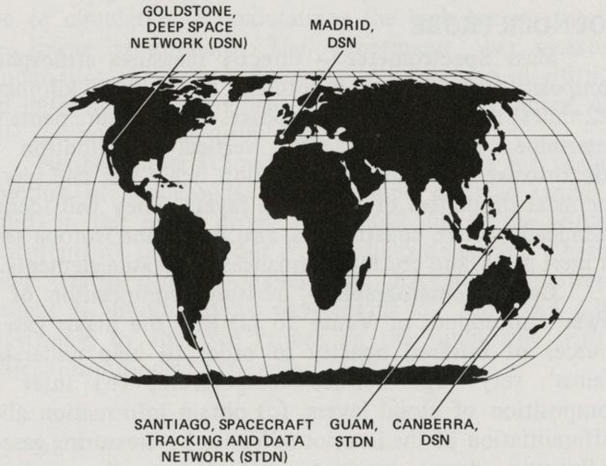
PROBE DATA RETURN



Mission Control will be at Kennedy Space Center, Florida for launch and at the Pioneer Mission Operations Center at Ames for the rest of the mission.

Incoming telemetry data from the spacecraft is formatted at DSN stations for high-speed transmission to Ames computers. These computers will check for critical changes and provide data for analysis by spacecraft, experiments, and ground systems specialists. Their analyses will be used immediately for spacecraft control. Outgoing commands are verified by Ames computers and sent to DSN stations for transmission.

Venus wind speeds will be determined by computation of exact flight paths of the four Probes. The flight paths will be calculated by radio triangulation among the probes, the Bus, and four ground stations, including two supplementary NASA stations at Guam and Santiago, Chile.



MULTIPROBE EXPERIMENTS – WHAT THEY TELL

SOUNDER PROBE

Mass Spectrometer – directly measures atmospheric composition and vertical structure in the lower 67 kilometers (42 miles) of the Venus atmosphere. The measurements will determine abundances and vertical distribution of noncorrosive gases, and composition, scale size and physio-chemical properties of the cloud layers. They will identify chemically active constituents, and determine isotope ratios of inert gases, and crustal abundances of volatile elements.

Gas Chromatograph – measures composition of the lower atmosphere of Venus to (a) find the major gaseous sources of infrared opacity in order to help understand Venus' very high surface temperature, (b) infer the composition of cloud layers, (c) obtain information about differentiation of the interior of Venus by measuring gaseous radioactive decay products, (d) deduce the similarity between Venus and Earth from abundance of sulfur compounds, and (e) infer how Venus' atmosphere evolved.

Cloud Particle Size Spectrometer – measures particle size and number density in the clouds and lower atmosphere of Venus from 67 km (42 mi) down to the surface, defining levels of cloud layers. Information on particle size and mass, with cloud characteristics such as cloud particle mass content, optical depth and spectral properties, should provide clues to basic cloud formation processes.

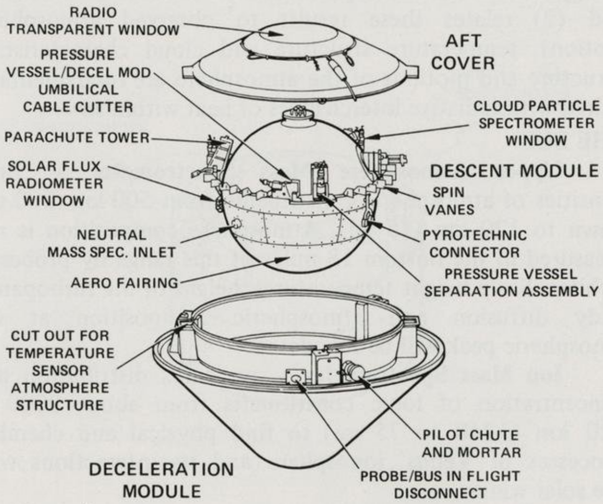
Solar Radiometer – measures the deposition of solar energy with depth in the atmosphere of Venus, obtains information on the vertical cloud structure, and may find scattering properties of cloud particles.

Infrared Radiometer – determines divergence of the thermal flux in order to define heat sources and heat-sinks, to detect cloud layers and infer their composition, to determine opacity of clouds in the infrared spectral region, and to estimate abundance of water vapor in the lower atmosphere.

ALL PROBES

Atmosphere Structure Instrument – measures thermal structure of the atmosphere from 200 km (124 mi) down to the surface at the four entry locations of the Large and

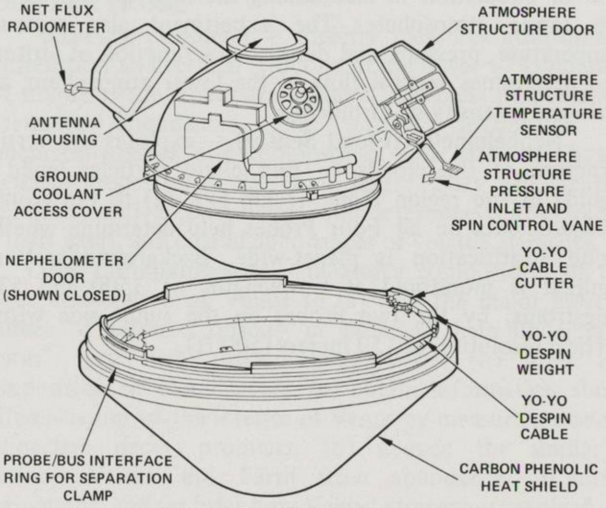
SOUNDER PROBE EXPERIMENTS AND SYSTEMS



Small Probes. Instrument also measures temperature as a function of pressure precisely enough to help understand the role of circulation in maintaining the high temperature of the lower atmosphere. The experiment also measures temperature, pressure, and density as a function of altitude; and determines vertical flow in the lower atmosphere, and scale and intensity of turbulence.

Nephelometer (Cloud Sensor) – explores the vertical structure of the clouds to find cloud particles (solid or liquid) in the region from 67 km (42 mi) to the ground. Measurements on all Four Probes help determine whether cloud stratification is planet-wide. Background scattered sunlight is monitored at wavelengths of 3500 and 5300 Angstroms, by the two Probes on the sunlit side with a vertical resolution of 150 meters (500 ft).

NORTH, DAY, AND NIGHT PROBE EXPERIMENTS AND SYSTEMS



DECELERATION MODULE

NORTH, DAY, AND NIGHT PROBES

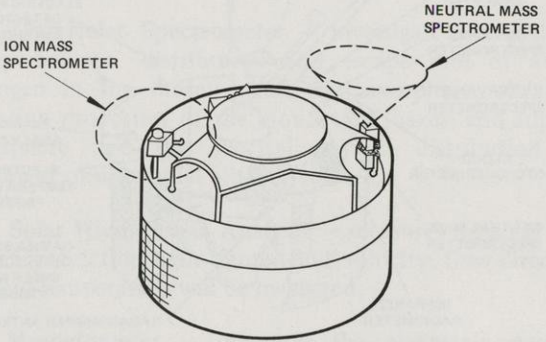
Net Flux Radiometer – (1) determines the global and vertical distribution of sources and sinks of radiative energy within the atmosphere and at the surface of Venus, and (2) relates these results to observed atmospheric motions, temperature structure and cloud characteristics. Structure and motions of the atmosphere are fundamentally linked with radiative interchanges of heat within it.

THE BUS

Upper Atmosphere Mass Spectrometer – finds densities of atmospheric constituents from 500 km (300 mi) down to 120 km (75 mi). Atmosphere composition is not measured in the bottom 18 miles of this range by probes or Orbiter. Scale height temperatures, height of the turbopause, eddy diffusion and atmospheric composition at the ionospheric peak will be calculated.

Ion Mass Spectrometer – measures distribution and concentration of ionic constituents from about 2000 to 120 km (1240 to 75 mi) to find physical and chemical processes of Venus' ionosphere and its interactions with the solar wind.

BUS EXPERIMENTS WITH VIEW ANGLES



MULTIPROBE RADIO SCIENCE, ALL PROBES
(Experiments which use spacecraft radio signals)

Differential Long-Baseline Interferometry (DLBI) – Wind velocities are measured by computing exact flight paths during the descents of all four Venus Probes. Experimenters employ ground-based radio-interferometric tracking (triangulation from three tracking stations). Wind velocities will be combined with simultaneous temperature, pressure, heat flux and composition measurements to test models of atmospheric circulation.

Atmospheric Attenuation Experiment – studies the atmospheric structure of Venus as it affects intensity and refraction of probe telemetry signals, and assesses communications for design of future probes.

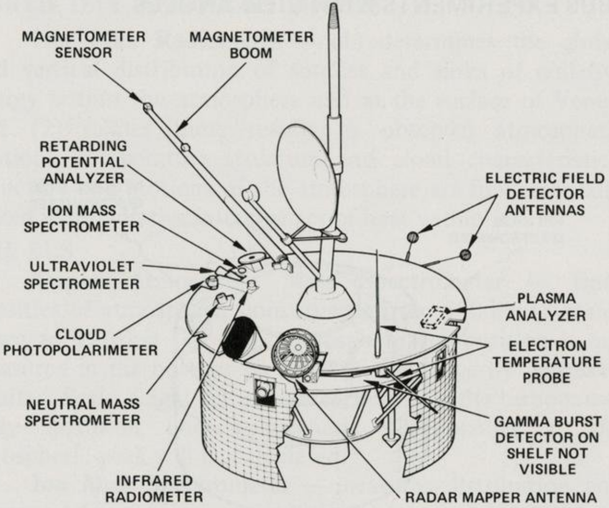
Atmospheric Turbulence Experiment – measures changes in probe radio signals to determine small scale turbulence of Venus' atmosphere, variations of intensity of turbulence with altitude, and wind velocity transverse to the line-of-sight path.

ORBITER EXPERIMENTS

Neutral Particle Mass Spectrometer – finds densities of neutral particles in the upper atmosphere from 150 km (93 mi) at periapsis to 500 km (300 mi). This will help define dynamic chemical and temperature states of the upper atmosphere. Vertical distribution of light constituents will help show the gas escape mechanism. Height of the turbopause (limit of atmosphere-mixing) will be determined by comparing density distribution of inert gases with similar measurements on the Large Probe.

Charged Particle Mass Spectrometer – measures distribution of ions in the upper atmosphere of Venus, to help understand Venus' ionosphere and its interaction with the solar wind.

Retarding Potential Analyzer – determines sources of energy input to the ionosphere, plasma transport and solar wind-ionosphere interaction processes, by measuring temperatures and concentrations of ions, ion drift, electron concentration and temperature, and ambient photoelectrons.



Electron Temperature Probe – measures thermal structure of the ionosphere to help understand how it is heated and cooled – probably by interaction with the solar wind at higher altitudes and by solar ultraviolet at lower altitudes. Electron concentration and ion mass also will be derived.

Ultraviolet Spectrometer – investigates temperature, energy balance, distribution and escape rate of atomic hydrogen in the thermosphere and exosphere, ultraviolet scattering properties of the cloud tops, hazes, and adjacent atmosphere and the spectral nature, distribution and movement of ultraviolet albedo features.

Solar Wind/Plasma Analyzer – measures the solar wind and its interaction with Venus. Bulk velocity, flow direction, flux and temperature will be measured.

Magnetometer – measures the planetary magnetic field; finds ionospheric current systems, energy and mass balance of the upper atmosphere; and investigates solar wind-Venus interaction.

Temperature Sounding Infrared Radiometer – obtains vertical temperature profiles in Venus' upper atmosphere from the dense cloud tops to the thermosphere (where temperature rises with height). The instrument gets horizontal temperature gradients in the atmosphere at seven pressure levels, from about one millionth of a millibar to 250 millibars in order to chart Venus' four-day circulation. It will find the total amount of sunlight reflected from Venus (albedo), study the top cloud layers and their global variability, and find the planet's energy budget and its correlation with its ultraviolet markings. Distribution of water vapor above the dense clouds will be estimated.

Cloud Photopolarimeter/Imaging – determines properties and distribution of cloud and haze particles in and above the visible clouds. Ultraviolet atmospheric markings and circulations are observed and apparent cloud motions measured. These take the form of pictures of the planet.

Radar Mapper – provides radar images of a band of Venus' surface circling the planet near the equator, from 6°

south to 44° north latitude, including many areas never seen before to this accuracy. It will resolve surface features as small as 20 km (13 mi) and derive surface heights to an accuracy of about 110 meters (360 ft). From these it can estimate global shape, the dielectric constant, small-scale slopes, surface emissivity and temperature.

Electric Field Detector – studies interaction between the solar wind and ionospheric plasma; locations of Venus' bow shock, ionopause and wake cavity boundary; heat flux, wave-particle interaction and upstream turbulence at the Venus-solar wind boundary, as well as electromagnetic noise bursts from Venus' atmosphere.

Gamma-Ray Burst Detector – observes intense, short-duration bursts of high energy photons from astronomical sources. The bursts were discovered in 1973, and their sources are unknown. Correlations of Venus Orbiter with near-Earth observations can provide directional determinations accurate enough for attempts at telescope identification of sources of bursts.

ORBITER RADIO SCIENCE

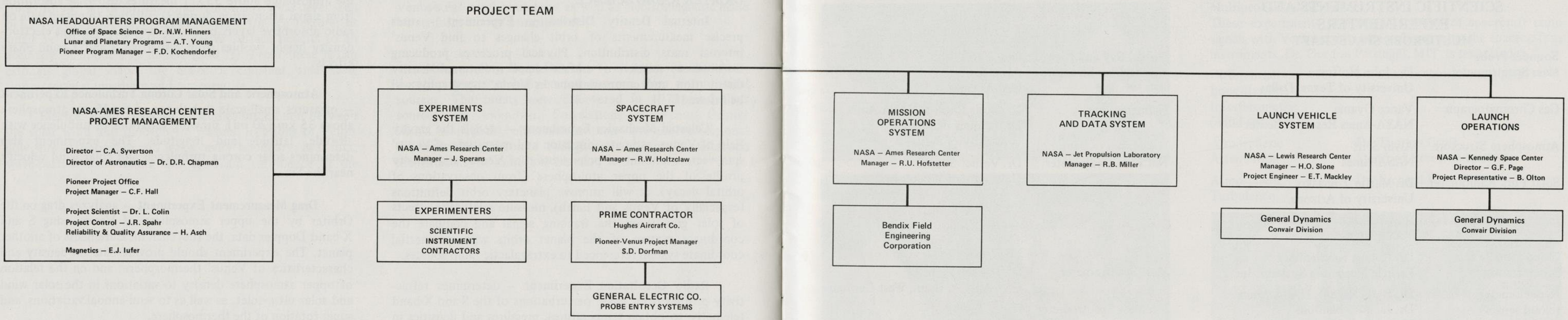
Internal Density Distribution Experiment – uses precise measurements of orbit changes to find Venus' internal mass distribution. Physical processes producing distribution, relation of surface shape to internal density distribution and compensations in Venus' topography will be inferred.

Celestial Mechanics Experiment – models the gravity field of Venus, estimates direction and magnitude of Venus' spin vector, amount of polar motion of Venus, and density profile of the upper atmosphere (from observations of orbital decay). It will improve planetary orbit definitions (especially of Venus and Earth), measure relativistic effects of solar gravity on the tracking signal and compare the coordinate system of the planet orbits with an inertial coordinate system referenced to extragalactic radio sources.

Radio Occultation Experiment – determines refractivity profiles from phase perturbations of the S and X-band telemetry to obtain temperatures, pressures and densities in the atmosphere above 35 km; measures dispersive absorption from signal attenuation during occultation to obtain data on radio absorptive layers below 50 km; and measures electron-density height profiles from dispersive S and X-band phase effects.

Atmospheric and Solar Corona Turbulence Experiment – measures small-scale turbulence of the Venus atmosphere above 35 km (20 mi), showing variations of turbulence with altitude, latitude and longitude. The experiment also determines solar corona turbulence and solar wind velocity near the Sun.

Drag Measurement Experiment – analyzes drag on the Orbiter by the upper atmosphere of Venus using S and X-band Doppler data, the first such measurements of another planet. The experiment should provide data on density and characteristics of Venus' thermosphere; and on the relation of upper atmosphere density to variations in the solar wind and solar ultraviolet, as well as to semi-annual variations, and super rotation of the thermosphere.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PROJECT MANAGEMENT
Director – C.A. Syvertson
Director of Astronautics – Dr. D.R. Chapman
Pioneer Project Office
Project Manager – C.F. Hall
Project Scientist – Dr. L. Colin
Project Control – J.R. Spahr
Reliability & Quality Assurance – H. Asch
Magnetics – E.J. Iufer
EXPERIMENTS SYSTEM
NASA – Ames Research Center
Manager – J. Sperans
EXPERIMENTERS
SCIENTIFIC INSTRUMENT CONTRACTORS
SPACECRAFT SYSTEM
NASA – Ames Research Center
Manager – R.W. Holtzclaw
PRIME CONTRACTOR
Hughes Aircraft Co.
Pioneer-Venus Project Manager
S.D. Dorfman
GENERAL ELECTRIC CO.
PROBE ENTRY SYSTEMS
MISSION OPERATIONS SYSTEM
NASA – Ames Research Center
Manager – R.U. Hofstetter
Bendix Field Engineering Corporation
TRACKING AND DATA SYSTEM
NASA – Jet Propulsion Laboratory
Manager – R.B. Miller
LAUNCH VEHICLE SYSTEM
NASA – Lewis Research Center
Manager – H.O. Slone
Project Engineer – E.T. Mackley
General Dynamics
Convair Division
LAUNCH OPERATIONS
NASA – Kennedy Space Center
Director – G.F. Page
Project Representative – B. Olton
General Dynamics
Convair Division

SCIENTIFIC INSTRUMENTS AND EXPERIMENTERS
MULTIPROBE SPACECRAFT

Sounder Probe

Mass Spectrometer	Dr. John Hoffman University of Texas, Dallas
Gas Chromatograph	Vance Oyama NASA-Ames Research Center
Atmosphere Structure	Alvin Seiff NASA-Ames
Solar Flux Radiometer	Dr. Martin Tomasko University of Arizona
Infrared Radiometer	Robert Boese NASA-Ames
Cloud Particle Size Spectrometer	Dr. Robert Knollenberg Particle Measuring Systems, Inc.
Nephelometer (cloud sensor)	Dr. Boris Ragent, NASA-Ames Dr. Jacques Blamont University of Paris

North, Day and Night Probes

Atmosphere Structure	Alvin Seiff NASA-Ames
Nephelometer	Dr. Boris Ragent, NASA-Ames Dr. Jacques Blamont University of Paris
Net Flux Radiometer	Dr. Verner Suomi University of Wisconsin

Bus

Mass Spectrometer	Dr. Ulf von Zahn University of Bonn, West Germany
Ion Mass Spectrometer	Harry Taylor NASA-Goddard

Multiprobe Radio Science

These experiments measure interaction of spacecraft radio signals with Venus and its atmosphere, using the spacecraft as instruments. Dr. Gordon Pettingill, MIT, is team leader.

Differential Long-Baseline Interferometry (wind speeds)	Dr. Charles Counselman, MIT
Atmospheric Attenuation	Dr. Thomas Croft Stanford Research Institute
Atmospheric Turbulence	Dr. Richard Woo, JPL

ORBITER SPACECRAFT

Neutral Mass Spectrometer	Dr. Hasso Nieman NASA-Goddard
Ion Mass Spectrometer	Harry Taylor, NASA-Goddard
Retarding Potential Analyzer	Dr. William Knudsen Lockheed Missile and Space Co.
Electron Temperature Probe	Larry Brace NASA-Goddard
Ultraviolet Spectrometer	Dr. Ian Stewart University of Colorado
Radar Mapper	Dr. Gordon Pettengill Massachusetts Institute of Technology
Magnetometer	Dr. Christopher Russell University of California, Los Angeles
Cloud Photopolarimeter, Imaging Instrument	Dr. James Hansen Goddard Institute of Space Studies
Solar Wind/Plasma Analyzer	Dr. John Wolfe NASA-Ames
Temperature Sounding Infrared Radiometer	Dr. Fredric Taylor Jet Propulsion Laboratory
Electric Field Detector	Dr. Frederick Scarf, TRW Inc.
Gamma Ray Burst Detector	Dr. W.D. Evans Los Alamos Scientific Laboratory

ORBITER RADIO SCIENCE
(G. Pettingill, MIT, team leader)

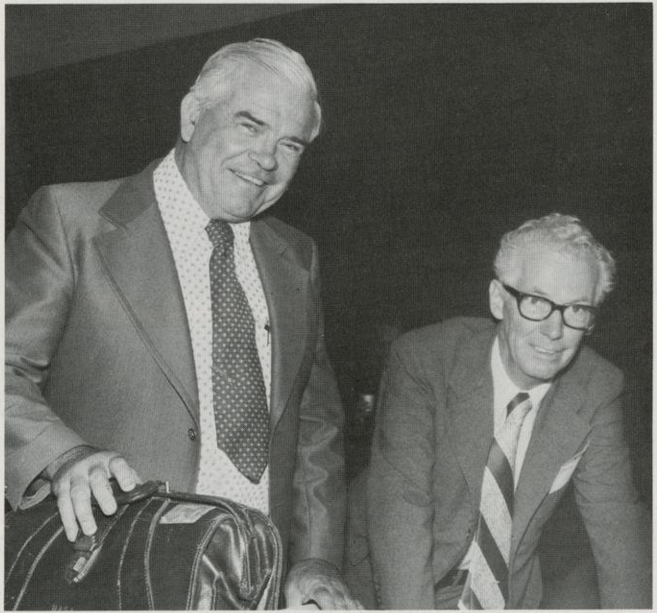
Venus Internal Density Distribution	Dr. Roger Phillips JPL
Celestial Mechanics	Dr. I.I. Shapiro, MIT
Radio Occultation	Dr. Arvydas Kliore, JPL Dr. Thomas Croft, SRI
Atmospheric and Solar Corona Turbulence	Dr. Richard Woo, JPL
Atmospheric Drag	Dr. Gerald Keating NASA-Langley

INTERDISCIPLINARY SCIENTISTS

Interdisciplinary scientists have been selected for both the Multiprobe and Orbiter Missions to provide assistance in analyses of the Venusian atmosphere. They are:

Dr. Siegfried Bauer	NASA-Goddard Space Flight Center
Dr. Thomas Donahue	University of Michigan
Dr. Richard Goody	Harvard University
Dr. Donald Hunten	University of Arizona
Dr. James Pollack	NASA-Ames
Nelson Spencer	NASA-Goddard
Harold Masursky	U.S. Geological Survey
Dr. George McGill	University of Massachusetts
Dr. Andrew Nagy	University of Michigan
Dr. Gerald Schubert	University of California, Los Angeles


SG PARTY

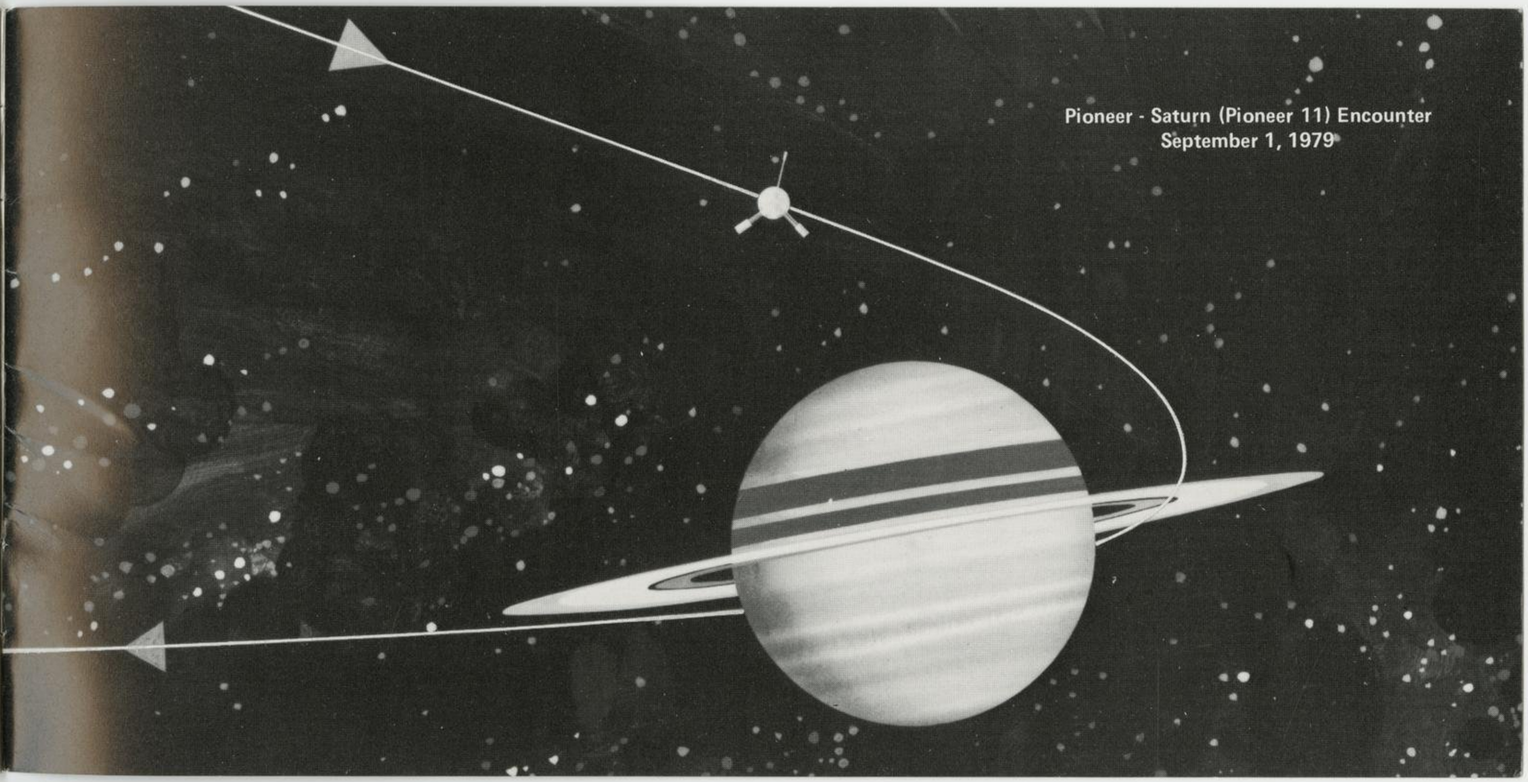


PIONEER ACCOMPLISHMENTS

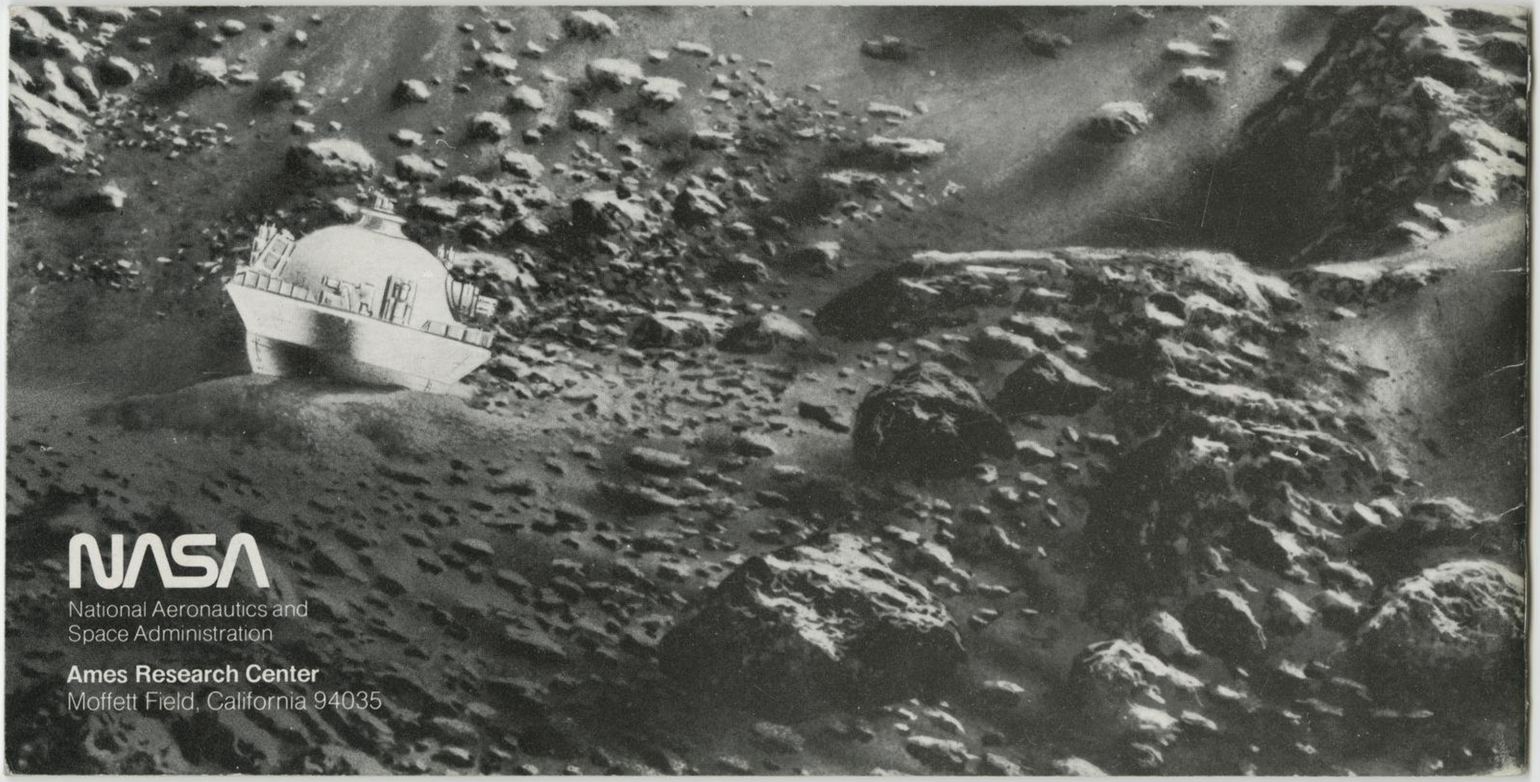
(Pioneers 10 and 11 have made flights to Jupiter and are now, respectively, leaving the solar system and en route to Saturn. Pioneers 6 to 9 are still active solar orbiters.)

1. First trip to Jupiter (Pioneer 10).
2. First flight out of the solar system, Pluto's orbit crossing in 1987 (Pioneer 10).
3. First trip to Saturn; arrives Sept. 1, 1979 (Pioneer 11).
4. First spacecraft to traverse the Asteroid Belt and find it offers little hazard to spacecraft (Pioneer 10).
5. First spacecraft to fly high above Earth's orbit plane (100 million miles), measuring phenomena from 17° above solar equator (Pioneer 11).
6. Discovery of dipole character of the Sun's magnetic field, a basic finding believed to apply also to all main-sequence stars in the universe (Pioneer 11).
7. Discovery that Jupiter is an entirely liquid planet (Pioneer 10).
8. Discovery that peak intensity of Jupiter's radiation belts at 27,000 miles from the surface is many millions of times Earth's, but high-velocity passage at 107,000 mph by spacecraft is feasible (Pioneer 11).
9. First model of Jupiter's enormous, pulsating magnetosphere (Pioneers 10 and 11).
10. First measurement of massive fluxes of electrons accelerated by the moon, Io, which appear to be related to the source of Jupiter's huge decametric radio signals. Jupiter is the strongest radio source in the sky except the Sun (Pioneer 11).
11. Longest-lived operational interplanetary spacecraft (Pioneer 6, launched December 16, 1965).
12. First analyses of the workings of the heliosphere, the Sun's atmosphere which extends beyond Jupiter (Pioneers 6 to 11).
13. First continuous reporting of "solar weather" by four stations around the Sun (Pioneers 6 to 9).

14. First occultation by the solar disc of a man-made signal source (Pioneers 6 and 9).
15. First accurate measurements of mass and densities of Jupiter's planet-sized moons, a key to Jupiter's formation history (Pioneers 10 and 11).
16. First closeup pictures of Jupiter, Jupiter's Great Red Spot, Belts, Zones and other features, showing details of atmosphere circulation (Pioneer 10).
17. First pictures and first closeup pictures of Jupiter's poles showing breakdown of belt and zone structure and localized atmosphere circulation there (Pioneer 11).
18. Findings that Jupiter's magnetic tail extends to Saturn's orbit; stream-stream interaction of the solar wind; Jupiter as source of high energy particles as far inward as Mercury; blocking of low energy cosmic rays from inner solar system (Pioneers 10 and 11).
19. Discovery that both the gegenschein and zodiacal light are neither Earth nor Asteroid Belt-related phenomena but due to evenly-distributed interplanetary dust, and that the "interstellar wind" enters the heliosphere in the plane containing the planets not from direction of solar system motion (Pioneers 10 and 11).



Pioneer - Saturn (Pioneer 11) Encounter
September 1, 1979



NASA

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