Sert II Test Is Subject At Meeting

The six month orbital SERT II test of ion engines in space will be one of the topics featured in papers by Lewis scientists at the AIAA's Electric Propulsion and Plasmadynamics Specialist Conference at Colorado Springs September 11-13.

The development conducted at Lewis to make the system flight worthy will be described in a paper by William R. Kerslake, David C. Byers and John F. Staggs. Thise development resulted in many increases in performance and knowledge of the major components.e

Robert T. Bechtel's paper, "Discharge Chamber Optimization of the SERT II Thrustor," tells about the configuration providing propellant utilization efficiencies in excess of 90 per cent for some operating conditions.

The largest scale Kaufman thrustor to date, 1.5 meters in diameter, will be discussed in a paper by Shigeo Nakanishi and Eugene V. Pawlik. This thrustor has attained an overall efficiency of 70 per cent with a specific impulse of 8150 seconds.

Other papers to be presented include: "High Perveance Accelerator Grids for Low Voltage Kaufman Thrustors," by Shigeo Nakanishi, Edward Richley and Bruce Banks; "Radio Frequency Induction Heating of Low Pressure Plasmas," by Ronald J. Sovie and George R. Seikel; "Radioisotope Heating for Contact Ionization Thrustors," by Charles Low; and "Lightweight Magnets for MPD Arcs," by Albert Johansen and Raymond W. Palmer.

Ingenuity is recognized...

William Ratvasky (left) points out his award winning insulation method to Jesse Hall, chief of the Instrument and Computing Division. (Martin Brown photo)

Inventions net $1200

Thirteen Lewis researchers and two former Lewis employees recently won eight awards totaling $1200 for their inventions.

The largest individual award of $200 went to Lawrence P. Ludwig, head of the Seals Section, Fluid System Components Division, for developing a low leakage shaft seal which can be used with many types of liquids, such as water, sodium, and oil. The seal has positive contact sealing under static conditions when there is no rotation or movement. A positive separation of the sealing surfaces while the shaft is operating minimizes shaft and seal wear.

A method for developing the highest strength metal known to man at temperatures above 3500 degrees Fahrenheit won a joint $400 award for three members of the Materials and Structures Division and a former Lewis employee. They are: William D. Klopp, head of the Refractory Metals Section; Peter L. Raffo and Walter R. Witzke, both metallurgists in the Refractory Metals Section; and Lester S. Rubenstein, now associated with the Atomic Energy Commission. The tungsten base alloy contains rhenium, hafium, and carbon in proportions which increases the alloy's strength to 800 per cent of that of unalloyed tungsten.

Two members of the Nuclear Systems Division, Edward Lantz, head of the Reactor Section, and Harry W. Davison, a nuclear engineer in the Reactor Engineering Section, shared a $100 award for developing a gaseous control system for nuclear reactors.

Four members of the Materials and Structures Division shared an award of $200 for developing a refractory fiber-reinforced superalloy that is four times as strong as the strongest conventional superalloy. They are: John W. Weeton, chief of the Composite Materials Branch; Robert A. Signorelli, head of the Fiber Metallurgy Section; Donald W.a Petrasek, materials engineer ina the Fiber Metallurgy Section; anda Gerald B. Beremand, materials engineering technician in the Fibera Metallurgy Section.a

Frank E. Rom, head of the Advanced Nuclear Concepts Branch of the Nuclear Systems Division, won $50 for developing an improved gas core nuclear reactor. The invention incorporates an improved system for cooling the reactor walls so that they can withstand the thermal heat of the nuclear reaction which is at temperature levels far above the melting or boiling point of most materials.

Shigeo Nakanishi, an aerospace research engineer in the Electromagnetic Propulsion Division's Propulsion Components Branch, shared a $100 award with former Lewis employee Paul Margosian for development of a single grid accelerator system for an ion thrustor. Nakanishi splitanother $100 award with Bruce A.a Banks, a physicist in the EPLa Division, for developing a glass coated grid for an ion thrustor accelerator system. Banks also received aa $50 award for developing an improved process eliminating heliuma bubbles in the glass coating on thea ion accelerator grid.a

Glass coatings for more than

The way in which research in one field often leads to developments in another totally different field which in turn leads back to advances in the first field was illustrated most recently at Lewis by the work on single grids for electron bombardment ion engines.

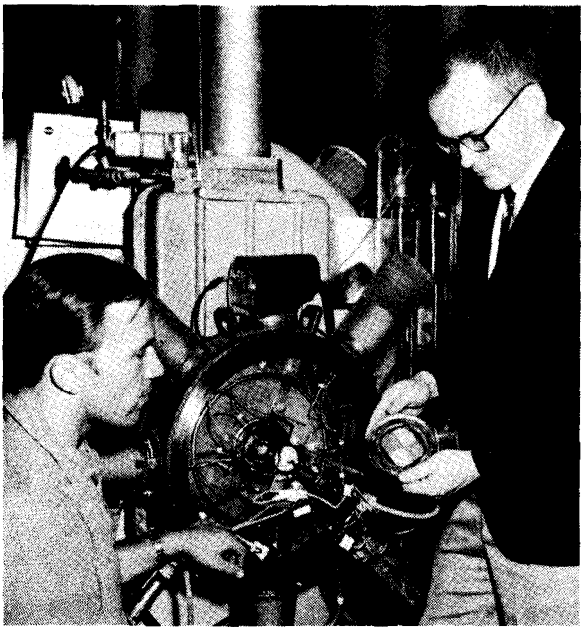
Robert Hartzell, a
the environmenta
Brown photo)a

Ion engines, which may someday be a prime source of propulsion for interplanetary missions, have historically had two grids at the nozzle of the engine. An ion engine operates by bombarding a plasma with electrons to form ions and accelerating the ions out of the rear of the engine to provide thrust. In order to contain the plasma in the bombardment chamber, one grid was used which was positively charged. In order to attract and accelerate the ions out the rear of the engine, another grid was used which was negatively charged.

The two grids were generally separated by about 1/10th of an inch. The exact distance is determined by the other dimensions of the engine but is carefully calculated to be far enough apart to prevent electrical breakdown between the grids and close enough to be efficient in attracting the ions. In order to maintain the exact distance, extra careful handling was important, as well as protection during launch. Buckling and warping could also occur from the heat of normal operation which could result in poor ion focusing and reduced grid life.

"Since 1967," Edward A. Richley, Chief of the Ion Physics Branch, says "we have been working to develop a single composite grid which would be less complex and more durable than the double grids."

One answer appeared to be the construction of a single grid with an insulating glass coating. However, the problem was that conventional methods of fusing a glass coating on metal left small bubbles in the glass.

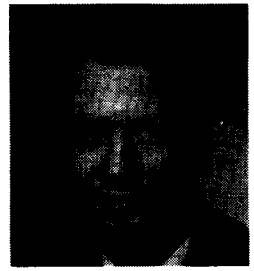


Andrew Aron, apprentice mechanic, and Bruce Banks, aerospace engineer, discuss a four-quadrant glass-coated grid being prepared for a vacuum chamber test. The new geometry permits vectoring the ion beam in two directions. (Martin Brown photo)


SCHWARTZ


BANKS


WATERS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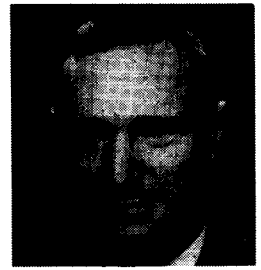
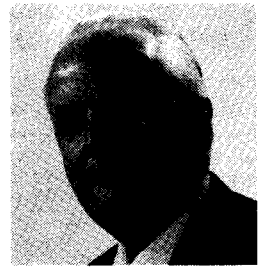

FRECHE


ANDERSON


PETERSON

Five patents issued

A patent was issued this month for a "High Speed Rolling Element Bearing." William H. Anderson and Harold H. Coe suggested a method to reduce the weight of rolling elements in bearings by drilling a hole either partially or completely through the rolling element. This reduction increases the bearing life by decreasing centrifugal loading. Anderson is Chief of the Bearings Branch, Fluid Systems Components Division, and Coe is a materials engineer in the section.

A patent was issued for an "Ion Thrustor Magnetic Field Control." Bruce A. Banks, an aerospace engineer in the Ion Physics Branch, Electromagnetic Propulsion Division, devised the method for controlling the magnetic field of an ion thrustor for improved starting and to eliminate stray magnetic fields which might interfere with sensing devices. The invention uses high ferromagnetic Curies temperature permanent magnets as have been used in previous systems. However, these are surrounded by a low ferromagnetic Curie temperature alloy shunt. When the thrustor is not operating, the magnet field lines are confined to the permanent magnets and shunt alloy. However, when the engine is operating and components are heated the shunt becomes paramagnetic and does not divert the permanent magnet fields. In effect this means the magnetic field in the discharge chamber of the ion thrustor can now be turned on and off without any external control equipment.

A patent was issued this month for a nickel base alloy with an incipient melting point of 2,375 degrees F. The alloy, developed by John C. Freche and William J. Waters, has superior strength at high temperatures, high impact resistance and does not become brittle at long exposure times at intermediate temperatures. It is composed of 17 to 22 per cent tungsten, 5.5 to 7.5. per cent aluminum and .7 to 1.7 per cent zirconium. The preferred alloy composition provides an ultimate tensile strength of 20,000 psi at 2200°F. Freche is Chief of the Fatigue and Alloys Research Branch, Materials and Structure Division. Waters is an aerospace technologist in the branch.

A patent was issued for a "Solid State Remote Circuit Selector Switch." Victor S. Peterson, an aerospace technologist in the Rocket Systems Division at Plum Brook, developed the circuit. It differs from existing circuits in that voltage logic is used to switch on a desired circuit. Mechanical relays, frequency responsive circuits, or capacitors in the remote load switching circuit are not required.

A method for detecting rapidly increasing magnetizing currents in an inverter transformer has won a patent. Dr. Francisc C. Schwarz, Chief, Power Electronics Branch, Spacecraft Technology Division, developed the technique. An auxiliary signal transformer detects the rapid increase and switches off the current. This is an advancement in the field of solid state inverters and converters used in spacecraft.

Lewis authors write for tech conferences

Lewis scientists and engineers are presenting technical papers at several conferences being held this month.

For the American Institute of Aeronautics and Astronautics' (AIAA) Seventh Thermophysics Conference, held San Antonia, Texas April 10-12 Ralph D. Sommers, Charles A. Raquet and John F. Cassidy, co-authored "Optical Properties of Thermal Control Coatings Contaminated by MMH/N_2O_4 Five-pound Thruster in a Vacuum Environment with solar simulation."

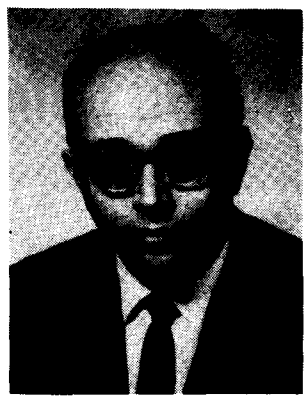
The combined AIAA, ASME, and SAE 13th Structures, Structural Dynamics and Materials Conference, and NASA Space Shuttle Technology Conference held 10-14 at San Antonio, Texas feature two Lewis engineers. They are, Hubert B. Probst, "Reusable Surface Insulation Material Research and Development;" and James R. Faddoul, "Application of Composite Materials to Space Shuttle Tankage."

The AIAA Ninth Electric Propulsion Conference April 17-19 at Bethesda, Maryland has scheduled co-authors Nelson L. Milder and James S. Sovey, "Optical Radiation frome Regions Downstream of Mercury Bombardment Thrusters;"e Walter C. Lathem, "Grid-Translation Beam Deflection Systems for 5-cm and 30-cm Diameter Kaufman Thrusters;"e Vincent K. Rawlin, Bruce A. Banks, and David C. Byers,e "Design Fabrication and Operation of Dished Acceleratore Grids on a 30-cm Ion Thrust;" and Robert T. Bechtel, "Ae 30-cm Diameter Thruster with a Variable Magnetic Baffle."e

Lewis inventors:

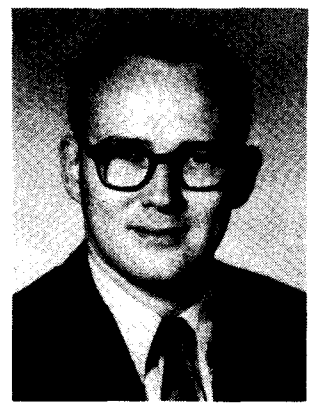
Invention Awards have been won by a number of Lewis employees during the past several months. Awards received from November 1971 through April 1972 are listed below. In an upcoming issue of the Lewis News more recent awards will be listed. Invention Awards are made under the provisions of the Government Incentive Awards Act.

Jacob D. Broder, an aerospace technologist in the Solar cell Branch, Energy Conversion & Materials Sciences Division, devised a method of binding cover glasses to solar cells. A thin film of a transparent plastic material is used as a binding material. This film is placed between the cover glass and the solar cell to form a laminate when heat and pressure are applied.



BRODER

Bruce A. Banks, an aerospace engineer in the Ion Physics Branch, Spacecraft Technology Division, invented an electromagnetic flow rate meter. The speed of a flowing liquid metal is measured by passing it through a magnetic field and measuring the resulting eddy currents with an ammeter. The current induced in the liquid metal by passing it through the magnetic field is directly related to the flow rate.



BANKS

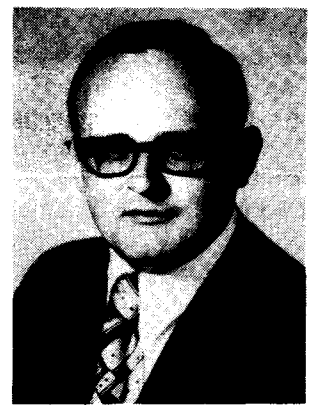
A method for fabricating hollow balls and rollers for rolling element bearings has been developed. Using this method, preformed components are diffusion welded by heating in a vacuum furnace under a light pressure. With this process no microdeformation is involved in the welding process, and no foreign material is introduced into the joint. Thomas J. Moore, a materials engineer in the Materials Applications Branch, Materials & Structures Division, developed the method.

MOORE

Richard J. Parker has developed a method for building improved bearings using low mass rolling elements which have high fatigue strength. Parker's bearings would use either hollow core rolling elements or solid but lightweight cores and be iron plated. An advantage of these bearings is the lighter weight of the balls and the longer life due to the lower centrifugal force on the outer race of the bearing. Parker is a materials engineer in the Bearings and Mechanical Power Transfer Branch, Fluid System Components Division.

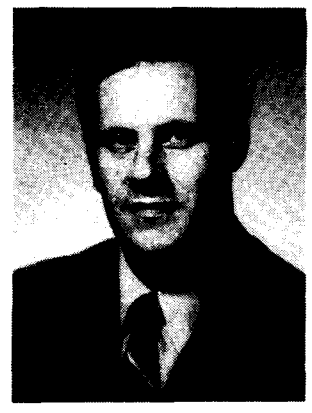
PARKER

Aerospace technologist James A. Burkhardt developed a method for improving the performance of a magneto-plasma-dynamic (MPD) arc thruster in the 600 to 2100 seconds specific impulse range by mounting a hollow cathode in the exhaust beam. This type of thruster is potentially useful for satellite station keeping and altitude control missions. Burkhardt is a member of the Advanced Concepts Branch, Nuclear Systems Division.



BURKHARDT

DR. SERAFINI



DELVIGS

Dr. Tito Serafini and Peter Delvigs, two members of the Structural Mechanics & Polymers Branch, Materials & Structures Division, received an award for their "Preparation of Polymides from Mixtures of Monmeric Diamines and Esters of Polycarboxylic Acids." High molecular weight polyimides are prepared by mixing a diester of an aromatic tetracarboxylic acid, an aromatic diamine, and a monoester of a dicarboxylic acid in an organic solvent. The mixture is then polymerized after which it is cured at a temperature of from about 275°C to 350°C. Dr. Serafini is Head of the Polymer Matrix Composite Section and Delvigs is an aerospace technologist.

WEBER

FRANCISCUS

A supersonic combustion rocket engine has been invented by Richard J. Weber, Chief of the Mission Analysis Branch, Wind Tunnel and Flight Division, and Leo C. Franciscus, an aerospace engineer in that branch. The engine eliminates the heavy turbomachinery presently used for liquid rocket engines. Weber and Franciscus used the exhaust of similar rocket motors to create a pressure differential between the fuel and oxidizer tanks and a mixing chamber to "pump" the propellants. The exhaust gases from the smaller rocket motor are also used to carry along the fuel oxidizer mixture and speed it up to supersonic speed. Two important advantages to the system, according to the inventors, was the significant reduction in weight gain from removing the turbopumps and increased specific impulse resulting from igniting the propellants flowing at supersonic speeds.

Inventors to be honored

The first "Lewis Invention Awards Luncheon" is scheduled for April 13 in the Main Cafeteria.

The luncheon is being held to honor all Lewis inventors. They will be represented by patentees who received patents in 1975. These patentees will receive plaques with an embossed replica of the first page of their patents from Center Director Dr. Bruce T. Lundin.

According to Norman T. Musial, Lewis Patent Counsel, the luncheon is a "first" for NASA and will serve as a forerunner for a NASA-wide luncheon to be held next year to coincide with National Inventors Day.

Those receiving plaques are Bruce A. Banks, Michael A. Gedwill, Salvatore J. Grisaffe, Lawrence P. Ludwig, William F. Hady, John C.o Evans, Jr., Henry W.o Brandhorst, Jr., Raymondo K.o Burns, Lloyd I. Shure,o Paul R. Prokopius, Edwardo F.o Baehr, Jack B. Esgar,o Edward A. Maslowski, Mileso O.dDustin, Anthony Fortini,o Albert J. Juhasz, Richard W.o Niedzwiecki, Jacob D. Broder, Donald L. Alger, Russello A.o Lindberg, Ralph D.o Thomas, Frederick T. Schuller and Warren A. Moore.o

lews LEWIS RESEARCH CENTER
CLEVELAND OHIO
NASA

April 30, 1976

Project engineer Jack Weigand (left) and Bruce A. Banks examine titanium material used in the dental supports research. (John Marton photo)

Through aerospace technology

Center seeks better dental supports

Engineers at Lewis are using materials technology developed for aerospace purposes to improve the life of implantable false teeth supports.

Dental implants are devices attached to the jawbone which protrude through the gum tissue and serve as supports for dentures which remain permanently in the mouth.

The object of the Lewis Center research effort, conducted as part of the Ion Beam Applications Research program, is to attempt to simulate the texture and surface structure of natural teeth root by using ion beam sputtering techniques.

The titanium material samples are exposed to bombardment by kilo-electron-volt titanium ions. The ions are discharged from a thruster similar to ones developed for space satellites.

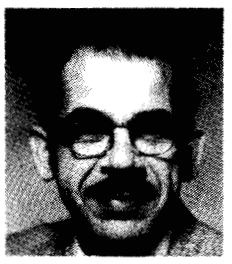
"Once a desirable surface treatment is attained, the titanium implants will be placed in dogs at a Cleveland-area hospital and the performance of the implants will be evaluated over a long period of time," explains Project Engineer Jack Weigand.

He added, "Researchers believe that tooth implants modified by ion sputtering techniques may result in long-lasting permanent dentures closely resembling the natural teeth they replace."

According to Bruce A. Banks, Head of the Small Thruster Section, titanium material is preferred for implantation because of its mechanical characteristics and compatibility with body fluids.

Surface sputtering by ion beam has demonstrated that the microscopic structure it creates closely resembles natural tooth root surface. Dental researchers feel that the duplication of this structure could result in improved performance and disease resistance of the implantable denture supports.


John C. Evans, Jr.


Anthony Fortini


Michael A. Gedwill

"He that invents a machine augments the power of a man and the well-being of mankind"
—H. W. Beecher


William F. Hady


Albert J. Juhasz


Russel A. Lindberg

Inventors awards ceremony

Although Lewis is generally known for several 'firsts' in space engineering programs, a 'first' in the field of patents was achieved earlier this month when all Lewis inventors were honored for their contributions to NASA's patent program.

The inventors were represented by Lewis employees who had been issued patents in 1975.

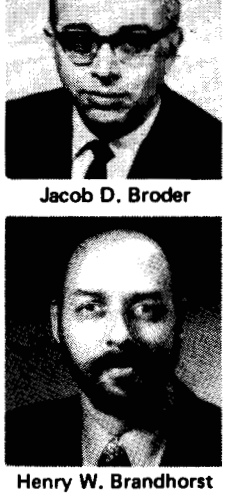
Center Director Dr. Bruce T. Lundin, who delivered the keynote speech at the address, also awarded plaques showing an embossed replica of the first page of their patents to the 1975 inventors.

In his talk, Dr. Lundin cited the advantages of issuing patents to the Government on inventions made by Government employees. He pointed out that Government-owned patents are valuable if and when the inventions have to be defended against lawsuits.

Another value, Dr. Lundin said, was the view expressed by President Ford that patents are a valuable natural resource and positive steps should be undertaken to have Government-owned patents used for the general public need.

Turning again to NASA inventors, he said that the NASA Patent Licensing Program has the power to grant exclusive licenses to small business and minority firms in areas of surplus labor in order for them to survive and compete in the marketplace.

Introductory and closing remarks were made by Lewis Patent Counsel Norman T. Musial. He stated that efforts were underway here to interest other NASA Centers in similar Inventors Day Awards Luncheons. "The overall objective is to have a NASA-wide inventors day ceremony next year and select some NASA inventors to participate in the annual National Inventors Day ceremony."


Jack B. Esgar


Miles O. Dustin


Salvatore J. Grisaffe

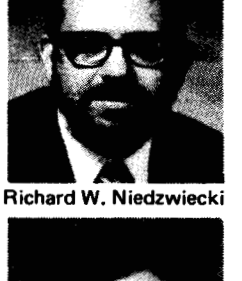
Jacob D. Broder

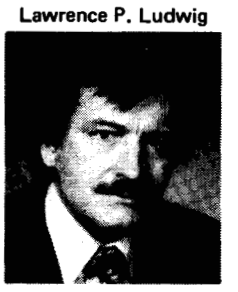
Henry W. Brandhorst


Edward F. Baehr


Bruce A. Banks


Donald L. Alger


Lawrence P. Ludwig


Edward A. Maslowski


Warren A. Moore

Richard W. Niedzwiecki


Paul R. Prokopius


Frederick T. Schuller

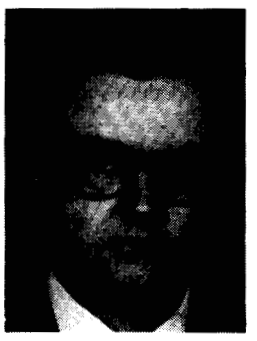

Lloyd I. Shure


Ralph D. Thomas

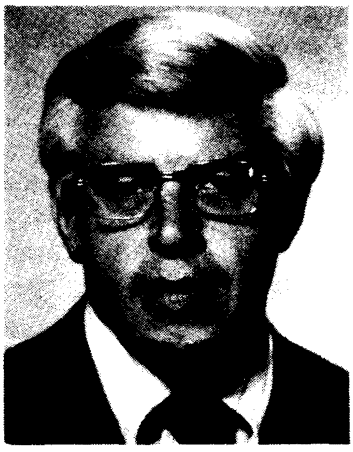
Lewis Office of Patent Counsel


Gene Shook, Sr.
Patent Advisor


Norman T. Musial
Patent Counsel


James A. Mackin
Patent Advisor

Dr. James W. Blue



Norman T. Musial

NASA Inventors' Award is Musial's brainchild

The second annual NASA Inventor of the Year awards were presented at an Inventor's Day Exposition in Washington, D.C. last month. This is a program conceived by Lewis Patent Counsel Norman T. Musial.

Names of this year's winners will be announced in the next issue of the *Lewis News.*

The winning patents, selected by a blue ribbon panel at NASA Headquarters, were also entered in the prestigious award competition of the Association of Invention and Innovation.

Dr. James Blue was one of the 1976 finalists considered by the Headquarters panel. Dr. Blue received a patent on a method of producing Iodine 123. Persons finally selected as NASA Inventors of the Year for 1976 were Dr. Robert T.oJones of Ames for his "Oblique-Wing Supersonic Aircraft" patent and Dr. Richard T. Whitcomb for his "Airfoil Shape for Flight at Subsonic Speeds."o

Locally, Lewis inventors will again be honored by a "Lewis Inventors Day Awards Luncheon" on March 29 in the Main Cafeteria small dining room. The Lewis inventors will be represented by patentees who received patents in 1976. These patentees will receive plaques showing an embossed replica of the first page of their patents from Center Director Dr. Bruce T. Lundin.

Those receiving plaques are: William J. Anderson, Bruce Banks, Dr. James W. Blue, Henry Brandhorst, Jr., Jacob Broder, Salvatore Grisaffe, Stanley R. Levine, Lawrence P. Ludwig, Stanley J. Marsik, Dr. Charles E. May, Dr. Warren H.oPhillip, John L. Power, J. Anthony Powell, Harold E.o Sliney, Andrew Terpay, Lawrence H. Thaller, and Herberto A.oWill.o


Salvatore J. Grisaffe


Stanley R. Levine


Lawrence R. Ludwig


Stanley J. Marsik


Charles E. May


Warren H. Philipp

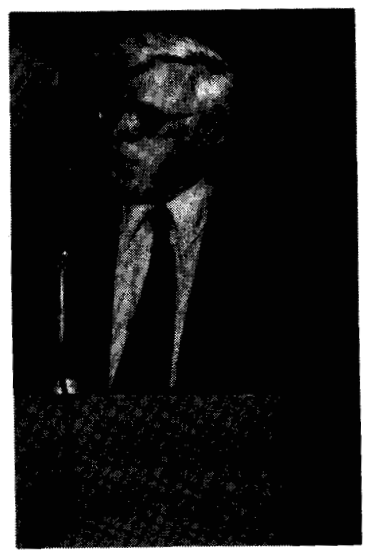

Anthony J. Powell

Second annual Lewis Inventors Award ceremony

Lewis patentees of 1976 gathered at a luncheon on March 29 to recognize the Center's contribution to NASA's patent program.

Norman T. Musial, Patent Counsel, touched on the fact that the Inventors Day Luncheon is part of an overall NASA program to provide proper recognition and incentive to inventors of the agency.

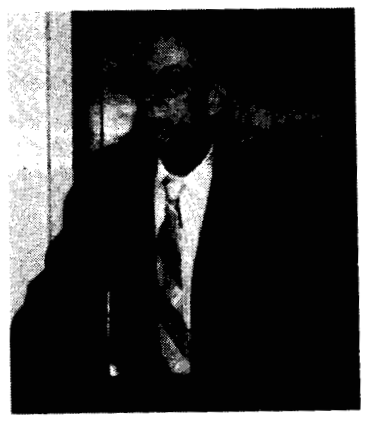
He further cited Dr. James W. Blue as one of the finalists considered for the NASA Inventor of the Year award.



Center Director Dr. Bruce T. Lundin, in his keynote address, reminded the audience, which included supervisors of the patentees, the importance of government-owned patents because of the billion dollar level of infringement claims lodged against the government.

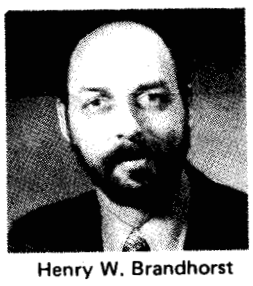
Dr. Lundin went on to emphasize that patents obtained by the government can be used very effectively to stimulate and promote the economy.

Following his address, Dr. Lundin presented plaques to 17 patentees. The plaques have an embossed replica of the first page of the patentee's patent and serve as an appreciation from the Center for such efforts.



"With last year's objective to have a NASA Inventor of the Year ceremony now a reality, the Center looks forward to 1978 and beyond with renewed interest in NASA's patent program," Musial commented.

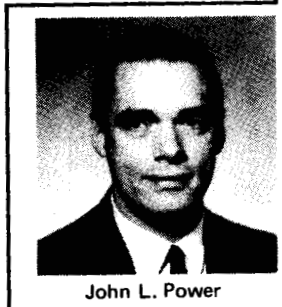

Jacob D. Broder

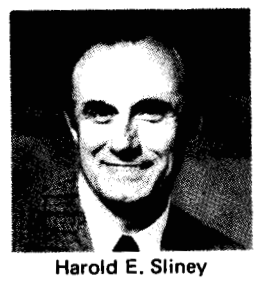

Henry W. Brandhorst

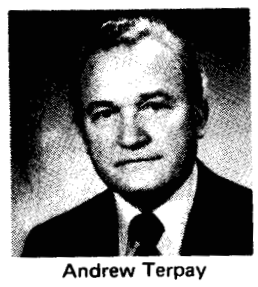

James W. Blue


Bruce A. Banks


William J. Anderson


John L. Power

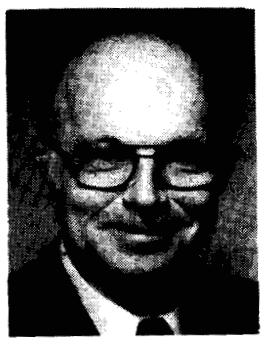

Harold E. Sliney


Andrew Terpay


Lawrence H. Thaller


Herbert A. Will

Lewis Office of Patent Counsel


Gene Shook Sr.
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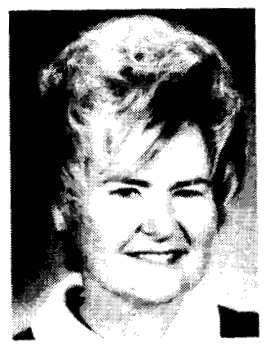
Norman T. Musial
Patent Counsel


James A. Mackin
Patent Advisor


Mildred C. Hutchison
Administrative
Assistant

"Invention, strictly speaking, is little more than a new combination of those images which have been previously gathered and deposited in the memory."
—Sir J. Reynolds

"Where we cannot invent, we may at least improve."
—Colton


Donald L. Alger


Edward F. Baehr


Bruce A. Banks

"Invention, strictly speaking, is little more than a new combination of those images which have been previously gathered and deposited in the memory."
—Sir J. Reynolds


Harvey S. Bloomfield


James E. Burnett

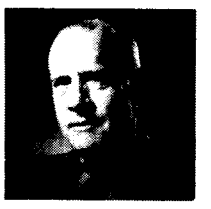

Christo C. Chamis

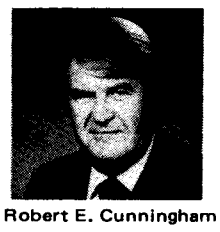

David A. Culp


Frank D. Berkopec


Arthur G Birchenough


Charles P. Blankenship


Glen E. McDonald


Robert E. Cunningham

Third Annual Inventors Award Ceremony

Dr. Seymour C. Himmel addresses Lewis inventors. (Martin Brown photo)

Lewis inventors, represented by patentees of 1977, were recognized on April 18 at a luncheon given in their honor. The Inventors Day luncheon originated at Lewis two years ago. It will be duplicated at Langley for the Langley inventors in May.

Norman T. Musial, Lewis Patent Counsel, touched on the endorsement by NASA Headquarters of the Inventor of the Year Award which also was established two years ago. This year the Award was given to Clarence Cone, Jr. of Langley for his 1977 patent on controlling biological cell division which may be of great value in the search for a cancer cure.

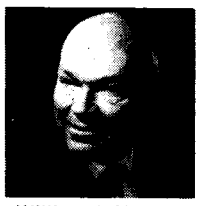
Robert Kempf, NASA's Assistant General Counsel for Patents, spoke of the importance of recognition as being an important incentive to inventors.

Associate Director Dr. Seymour Himmel, in his keynote address, emphasized the close partnership with the Department of Energy in the fields of gas turbines, Stirling engine, solar and wind energy and the importance of patents from these activities.

Dr. Himmel pointed out that the patents will be important in protecting the government against infringement claims, which are at a current level of a billion dollars and climbing. He went on to say that patents can be used to create businesses and aid in stimulating the economy.

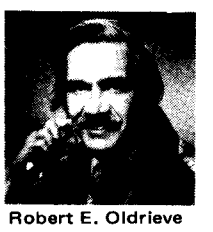
Following his address, Dr. Himmel presented plaques to 32 patentees. The plaques have an embossed replica of the first page of the patentee's patent and serve as an appreciation from the Center for such efforts.

"With the annual luncheon for NASA inventors a reality at Lewis and Langley, we look to 1979 and beyond to establish similar recognition luncheons at other Centers," Musial commented.

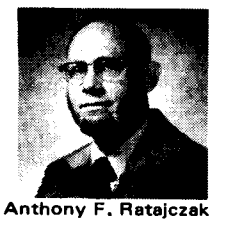

James F. Morris

William J. Nagle

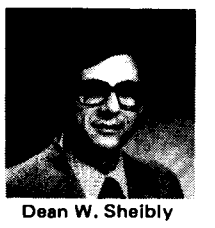

John C. Freche


Robert E. Oldrieve


Randall F. Gahn


Anthony F. Ratajczak


Li-Chen Hsu


Dean W. Sheibly


Raymond F. Lark

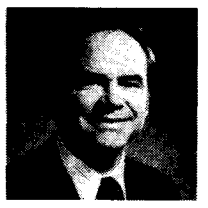

Leroy G. Sidorak


Curt H. Liebert

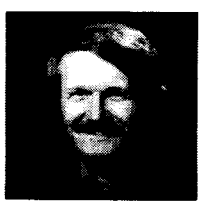

Stephan Stecura


Russell A. Lindberg


Robert Steinberg


Robert A. Lovell


Ralph D. Thomas


Cecil J. Marek

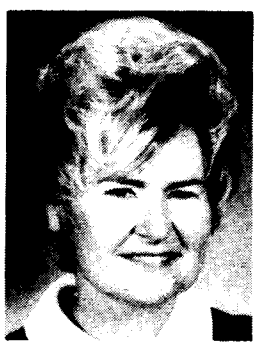

William J. Waters

Lewis Office of Patent Counsel


Gene Shook Sr.
Patent Advisor


Norman T. Musial
Patent Counsel


James A. Mackin
Patent Advisor


Mildred C. Hutchison
Administrative
Assistant

Cliff Brooks photos

Take a bow

Letters of appreciation for jobs well done reach Lewis personnel through channels, with the result that only a few persons share the kudos and congratulations. Oftentimes, those who deserve the most credit spend the least amount of time seeking it. Well, the Lewis News and the Awareness Committee feel that those who truly deserve to take a bow should be recognized! Consequently, the Lewis News from time-to-time will re-print excerpts from recent letters of commendation to Lewis employees and groups from institutions or individuals. Here are some recent ones. . .

Spotlight on.....Bruce Banks

A private citizen, Roger F. Walsh, wrote on behalf of Bruce and his work in bio-engineering, and specifically Bruce's involvement in the developing improved shunts used for hydrochephalic children. Part of his letter: "NASA does have these projects in bio-engineering and I hope and pray that you can be of assistance in seeing that the proper funding of these ventures is made available. Being the father of a hydrochephalic boy, I have seen him vomiting repeatedly and then lapse into semiconsciousness until he would be relieved by a surgical procedure. Mr. Banks feels that current space engineering technology can be applied to the improvement of the shunt." *Note:* Bruce is in the process of developing a hydrocephalic shunt project with neurosurgeons and a medical specialties company.

Spotlight on.....retiree Robert Seegert

Cleveland radio station WGAR made Bob a celebrity and saluted him with a special day in his name. Every hour on the half-hour, the station proclaimed "This is 1220/WGAR – Bob Seegert Station."

Spotlight on.....James L. Smialek and Bruno C. Buzek

The American Ceramic Society thought enough of Jim and Bruno's exhibit to include it in its Traveling and Permanent Exhibition. The duo's exhibit was entitled "Protective Al_2O_3 Scales on Ni-Cr Al Alloys" and it was awarded a first place in the Transmission Electron Micrographs Class. F.E. Simms, chairman of this year's Ceramographic Exhibit, wrote, "I wish to thank you for your participation in the exhibit and ask your continued support in the future."

Spotlight on.....Tom Riley, Edwin Graebner, Francis Rooker, Wilhelm Benz and Harold Sample.

Johnson Space Center Director Christopher C. Crabb extolled as outstanding the "effort put forth by Lewis in support of the parylene coating of the remote power controllers for the Shuttle Orbiter 102. As a result of this fine effort, the Orbiter was able to successfully meet the power and testing requirements." He went on, "It is through efforts of men like these that NASA has been able to achieve its goals."

NASA
Lewis Research Center
Cleveland, Ohio

February 16, 1979

ALERT Committee members are (seated, from left) Linda Finke, Harold D. Wharton, chairman, Jack R. Colegrove and Robert J. Horansky. Standing (from left): Robert P. Allen, Robert J. Antl, Bruce A. Banks and Richard J. Woefle. (Martin Brown photo)

ALERT schedules speakers through May

A newly formed ALERT Committee has announced plans to present three visiting speakers in the coming months. ALERT, meaning Alerting Lewis Employees on Relevant Topics, is a continuation of a highly successful series of lectures which ran during 1971-1976. Harold Wharton serves as chairman.

Scheduled for Thursday, March 15, is Dr. Donald F. Gibbons, Professor of Biomedical Engineering at Case Western Reserve University. His topic will be "Synthetic Human Implants – The Bio-Material Problem."

On Wednesday, April 11, former staffer Robert "Skip" Nunamaker will return to Lewis to tell us about the results of the Pioneer-Venus program. Nunamaker is now Chief of the Space Projects Division at Ames.

Finally, on Wednesday, May 9, retired AF Colonel Walter Flint, Curator-Astronautics of the National Air and Space Museum of the Smithsonian Institute, will join us to talk about the development and operation of the museum.

Further details on each of these programs will be appearing in upcoming issues of the *Lewis News.*

36 scientists, engineers earn Tech Brief awards

Thirty-six Lewis scientists and engineers were recently honored for technical innovations which may find their way into the marketplace.

The recipients were presented cash awards for their technical breakthroughs which are regularly published as Tech Briefs. These circulate continuously to business and industry for possible commercial application.

Awards were presented last month in the Administration Building by Dr. Walter T. Olson, head of Technology Utilization for Lewis. Names of innovators and titles of their Tech Briefs are as follows:

William J. Anderson, "Improved Gas Thrust Bearings," **Ralph Forman, James S. Sovey and Arthur N. Curren**, "Ion Beam Textured Graphite—A Low Secondary Electron Emitting Surface," **Bruce Banks and Albert J. Weigand**, "Biomedical Application of Ion Beam Technology," **Coulson Scheuermann**, "High Gradient Continuous Casting Furnace," **Henry Brandhorst and Henry B. Curtis**, "Terrestrial Photovoltaic Measurements," **Harold Gold**, "A Hydraulic Pressure Regulator Design That Is Stable Without the Use of Sensing Line Restrictors of Frictional Dampers," **George E. Glawe, Raymond Holanda and Lloyd N. Krause**, "Standardized Temperature Probes for Gas Temperature Measurement Reduce Calibration Requirements," **David E. Brewe and Bernard Hamrock**, "Technique for Calculating Elastic Deformation for Ball Bearings, Gears and Cams," **Thomas J. Riley and Edwin C. Graebner**, "Method for Accurately Controlling and Measuring Dielectric Film During Deposition," **Lloyd I. Shure**, "Energy Conversion Alternative Study (ECAS)," **Thomas L. Junod and George Mandel**, "Directory of Fire Research," **Thomas L. Junod**, "Toxic Substances Handbook," **Lawrence P. Ludwig and Robert C.eBill**, "Gas Path Seal Material System," **Jacob D. Brodere and Americo F. Forestieri**, "Improved Method of Solar Celle Assembly," **Larry H. Gordon and Bert R. Phillips**, "Electrolysis Cell Computer Simulation Model," **Richard W.e Patch**, "Computer Program for Centroid, Moments, ande Radii of Gyration of an Area," **Lawrence F. Schumann,e** "Computer Program Calculates Edge Geometry of Turbomachine Blades," **John L. Power**, "Electroplating ande Stripping Copper on Molybdenum and niobium," **Miles O.e Dustin**, "Spring-Loaded Piston Sensor," **Edward F. Baehr,e** "Intraocular Pressure Reduction and Regulation System,"e **George B. Tuma (Co-op), Arthur G. Birchenough and William J. Rice**, "Instrument to Average 100 Data Sets," **Gustave C. Fralick**, "Computer Program for Calculating Pressure-Broadened Raman Spectra for Molecular Nitrogen ande Oxygen."e

ROBERT P. ALLEN
Candidate, Avon
Board of Education

LEROY McCREARY
Candidate, Berea
Board of Education

EARL T. BLOAM
Candidate, Brooklyn
Board of Education

BRUCE A. BANKS
Candidate, Olmsted Falls
Board of Education

Staffers vie for school board vacancies

While many Lewis employees are serving their communities as volunteer firemen, on city commissions, and in other capacities, others are running for school board vacancies in their respective communities.

Robert P. Allen, Chief, Manpower Program Branch, Personnel Division, is up for re-election to the Avon Board of Education. He has served for 13 years on the Avon school board in a variety of positions, including vice president.

How is he conducting a campaign against the seven candidates who are vying for the three openings? "I don't have a committee to help me. I am relying on persons who know me and my reputation as a longtime member of the school board to get re-elected," Allen said. He also plans to attend Candidates Night and certain other functions.

Leroy McCreary, personnel staffing specialist, Personnel Division, is the other known Lewis employee who is running as an incumbent. He is campaigning to retain his seat on the Berea Board of Education. McCreary and his committee are actively campaigning in Berea, Middleburg Heights and Brook Park, the cities comprising the Berea School District, against two opponents.

McCreary was appointed to the school board last July

(*Continued on page 3*)

School board candidates. . .

(*Continued from page 1*)

and has to get re-elected on November 6 to complete the two-year unexpired term. McCreary, who lived in Berea before moving to Brook Park, is emphasizing a return to the basic skills, the three R's and problem solving as part of his campaign.

Running for the first time to fill school board vacancies are Earl T. Bloam, research electrical engineer in the Engineering Design Division, and Bruce A. Banks, Head, Ion Beam Applications Section, Space Propulsion and Power Division.

Bloam is one of three Brooklyn Board of Education candidates endorsed by the Concerned Citizens for Education Committee. There are 10 persons running to fill the three vacancies. Bloam said, "The Concerned Citizens for Education Committee is a grassroots organization committed to putting persons on the Board who are responsive and receptive to the needs of the community."

He said that the school board issues have generated more interest than all the other campaigns. "If elected, I hope to develop an image of cooperation and openess by the school board."

Banks, as Allen, is conducting a low-key campaign. He hasn't printed any literature for distribution to voters in Olmsted Falls and isn't out on the hustings.

"I am running because I have four children in the school system and this is a way of having a voice in how the school system is run. Of course I'm in it to win. However, what is more important is that those elected reflect the sentiments of the people of Olmsted Falls."

Voters will be going to the polls on November 6 to elect their choices among Allen, McCreary, Bloam, Banks and others running for a wide variety of offices. Exercise your right to vote.

Take a bow

Letters of appreciation for jobs well done reach Lewis personnel through channels, with the result that only a few persons share the kudos and congratulations. Oftentimes, those who deserve the most credit spend the least amount of time seeking it. Well, the Lewis News and the Awareness Committee feel that those who truly deserve to take a bow should be recognized! Consequently, the Lewis News from time-to-time will re-print excerpts from recent letters of commendation to Lewis employees and groups from institutions or individuals. Here are some recent ones. . .

Take a bow. . . . . Harold Zager and Raymond Sotos

K.tShiraishi, project manager, Second Engineering Department of Mitsubishi Aircraft,t Inc., of San Angelo, Texas, was a pleased man indeed for the assistance Zager and Sotos gave during the company's tests on the MU-300 aircraft in the Icing Research Tunnel. Wrote Shiraishi: "We are very appreciative of the extra time you allotted us so that we could complete the tests. You and your staff worked very hard on our behalf and we thank you."

Spotlight on. . . . . Bob Walker, Sandy Kocsis, Linda Zemanek, Basil Kluchnik, Charles Noe and the entire staff of the Equipment and Supply Division.

Charles L. Wagner, Director of Supply and Equipment Management, NASA Headquarters, wrote glowing praise "for the outstanding job the division did as host of the 12th Annual Supply and Equipment Management Conference. My staff and I rank this conference as one of the most stimulating and successful ever."

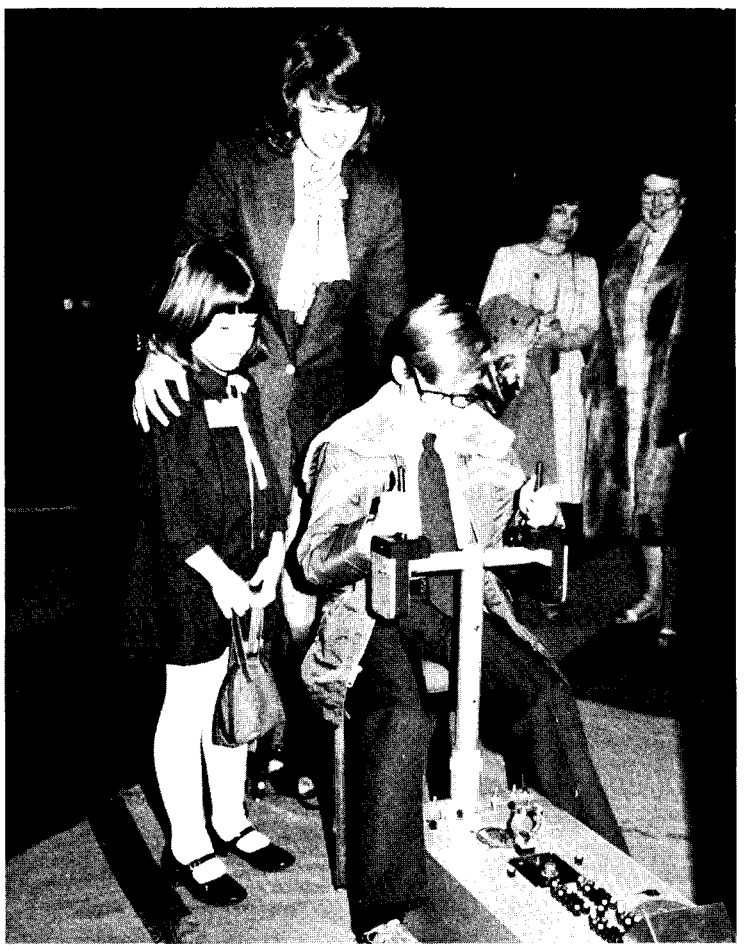
Take a bow again, Harold Zager.

Another company, Key Industries, of San Antonio, Texas, also added its thanks to Harold for the assistance and cooperation given that company during the MU-300 aircraft tests. Kenneth E. Yeoman, President, wrote: "The guidance you gave us based on your experience was invaluable and was a significant factor leading to tests of the shielded horn configuration."

Spotlight on. . . . . Bruce Banks and Albert Weigand

After Michael W. Ferralli and James B. Koeneman of Lord Corporation, Erie, Pennsylvania, visited Lewis to learn more about ion thruster technology, they wrote: "Your frank and informal expanation of both the ion thruster technology and its biomedical impact will allow us to more realistically incorporate ion beam technology to further our own research and development efforts. In particular, your suggestion to improve the ion generation system of a radial accelerator has greatly simplified our design problems in this area."

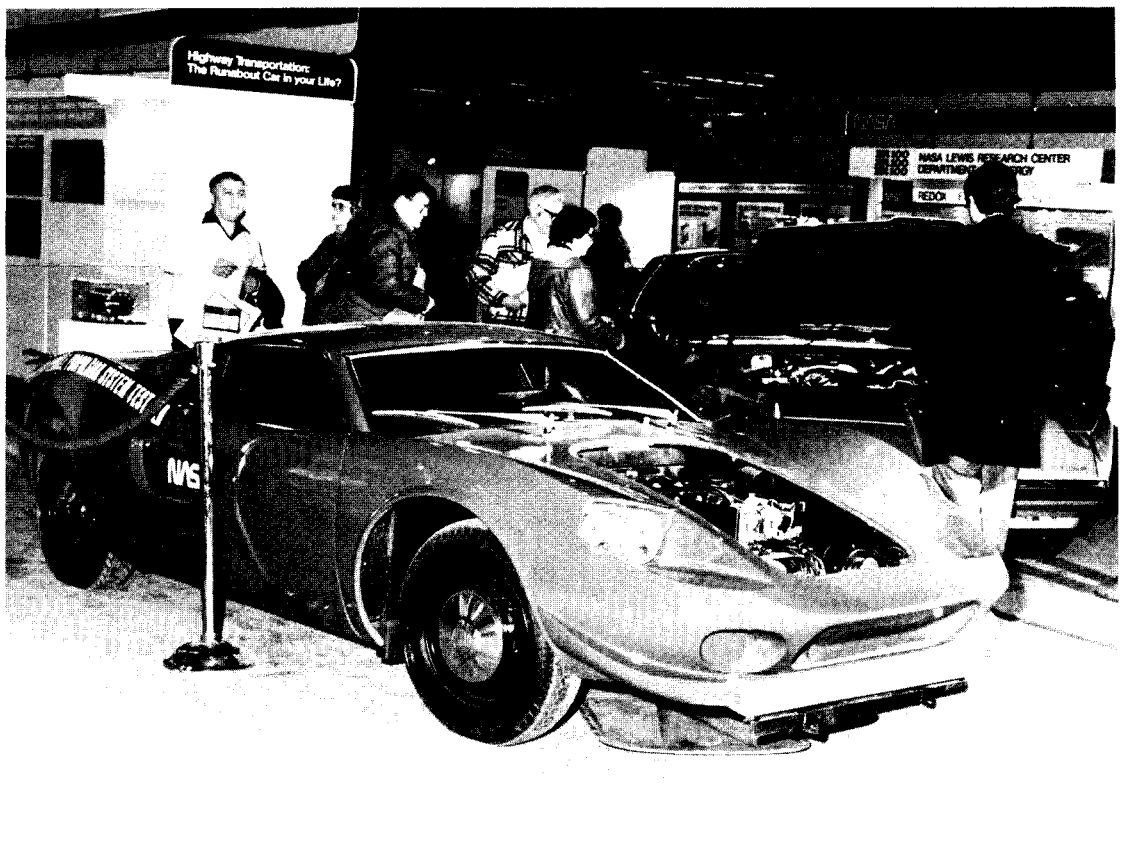
Lewis exhibits shown at Home, Space Odyssey shows



Having fun at the Space Odyssey Show held recently at CCC's Metro Campus are Dr. John F. McCarthy's daughter and astronaut Shannon Lucid. Boy at dexterity machine is unidentified.

Sue Johnson got almost as much attention at the Home and Flower Show as the general aviation aircraft blade.

The Center's research in communications technology is explained to Home and Flower Show attendees.



The electric car got lots of notice at the Home and Flower Show.

If you did not attend either the Home and Flower Show or the Space Odyssey held in Cleveland recently, you missed some very fine exhibits extolling Lewis and the NASA agency. For those who did not attend, here are some pictures from both events. Photos by Don Huebler and Dan Laity.

Bruce Banks and Kathy Zona man blood pressure exhibit at Home and Flower Show.

NASA

Lewis Research Center
Cleveland, Ohio

April 10, 1981

Banks among 10 throughout government receiving award

Bruce A. Banks, head of the In-Space Research and Technology Section, has been selected to receive the 1980 Arthur S. Fleming Award which honors outstanding young men and women in the federal service.

Banks is one of ten persons in federal service selected for the award. Five awards are given in the scientific and technical fields and five in the executive administrative fields.

BRUCE A. BANKS

The Lewis research scientist was chosen "for his outstanding achievement in developing a program applying NASA space technology for the direct benefit of mankind in biomedical devices."

Working with medical researchers, Banks produced unique micro-textured surfaces on a variety of materials used in prostheses and surgical implants.

He demonstrated that materials whose surfaces were modified by exposure to the beam of an ion thruster, originally developed for spacecraft propulsion, produced markedly different and more favorable response when implanted in body tissues.

Banks began at Lewis in 1966 in the Centaur Project Office. Later he was assigned to the Ion Physics Branch where he began research on ion thruster components for electric propulsion systems.

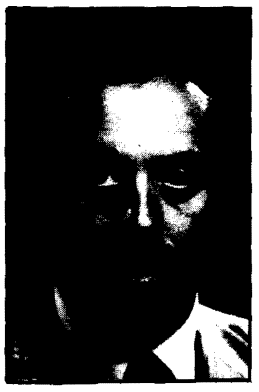
From 1977 to 1980, Banks' research was aimed at identifying, evaluating, developing and transferring non-propulsive applications of ion thruster technology to users. The programs he directed demonstrated that surfaces exposed to an ion thruster beam markedly improves material performance in such diverse applications as cold-welding, fluoropolymer bonding and biomedical devices.

Banks has authored or co-authored 26 publications and has 10 patents to his credit.

He earned a bachelor's degree in physics from Case Western Reserve University and a master's degree, also in physics, from the University of Missouri.

He lives in Olmsted Township with his wife, Judith, and their four children.


Bruce Banks


Robert Bill


Gerald Brown


An-Ti Chai

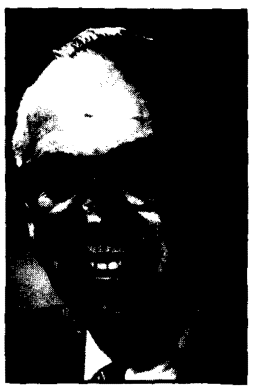

Arthur Curren


Daniel Deadmore


J. C. Evansa


Ralph Forman

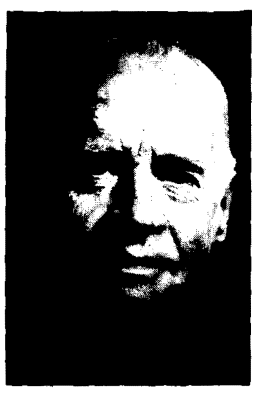

Randall Gahn

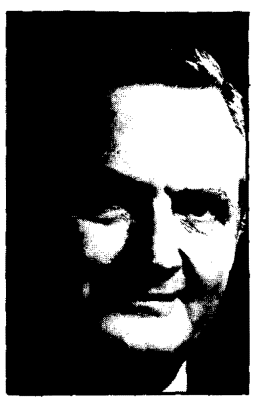

Robert Graham


Louis Kiraly


Henry Kosmahl

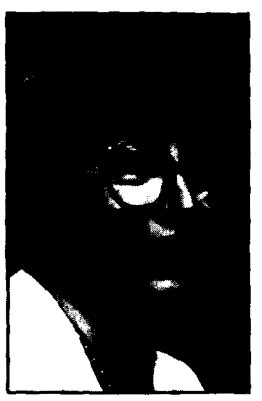

Curt Liebert


Glen McDonald


James Morris


William Nagle


S. S. Papell


Margaret Reid


Dean Sheibley


Daniel Soltis


James Sovey

Lewis inventors for 1983 honored at awards luncheon

Lewis inventors who received patents in 1983 were honored and presented plaques at the annual Inventors Awards luncheon Apr. 30 in the dining room of the main cafeteria.

Dr. John Klineberg, deputy director of Lewis, was guest speaker and made presentations at the ceremony.

Lewis Patent Counsel Norman Musial was master of ceremonies and explained the Inventor of the Year Award, an agencywide program.

Annually each NASA center submits one patent from that year to NASA Headquarters where one is selected for consideration in the national Inventor of the Year competition.

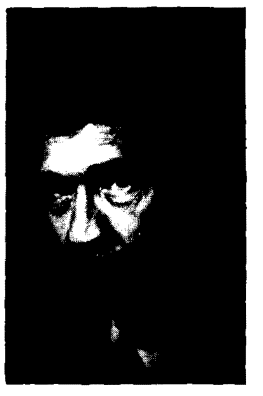
For 1983 a patent issued to Gerald V.nBrown for Magnetic Heatn Pumping was the Lewis candidate.n

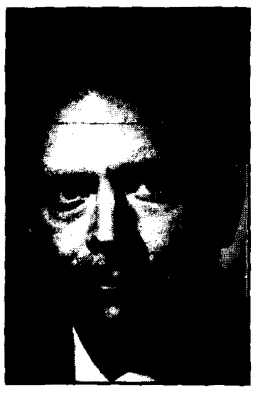
This year, though not for the first time, Lewis has one woman inventor, Margaret A. Reid, who is co-inventor with Randall F. Gahn and C.Y Yang of "Zirconium Carbide as an Electrocatalyst for the Chromous/Chromic."

Musial announced that the national inventor of the year is Robert Fishchell at Johns Hopkins Universities Applied Physics Laboratory.

Emphasizing the importance of obtaining patents on new devices, Dr. Klineberg said the Government often is sued for damages if we or any of our contractors infringe a patent.

Nineteen Lewis employees who received patents inn1983 andrinventor plaques at the luncheon are: Dean W. Sheibley, Daniel L. Deadmore, An-Ti Chai, Bruce A. Banks, Robert C. Bill, Randall F. Gahn, Margaret A. Reid, Robert W. Graham, Gerald V. Brown, Glen E. McDonald, Henry G. Kosmahl, Louis J. Kiraly, CurtnH. Liebert, Arthur N. Curren, Ralph Forman, James S. Sovey, Edwin G. Wintucky,nDanielnSoltisnand Williamn Nagel.


Edwin Wintucky


S. G. Young

Inventors who had patents issued in 1983 but no longer are at Lewis include: J.F. Morris, S.G. Young, J.C. Evans Jr., C.P. Goradia, D.W. Wisander,nC.Y.nYangnandnS.nStephenn Papell.n

Thirteen contractor employees also were granted patents and willnhave their plaques sent to them. □

Names of patents and last names of inventors are:

"Advanced Inorganic Separators for Alkaline Batteries and Method of Making the Same"; Sheibley

"Heat Pipes Containing Alkali Metal Working Fluid" and "Thermionic Energy Converters"; Morris

"Silicon-Slurry/Aluminide Coating"; Deadmore and Young

"High Voltage V-Groove Solar Cell"; Evans, Chai and Goradia

"Ion Beam Sputter-Etched Ventricular Catheter for Hydrocephalus Shunt"; Banks

"Laser Surface Fusion of Plasma Sprayed Ceramic Turbine Seals", Wisander and Bill

"Zirconium Carbide as an Electrocatalyst for the Chromous/Chromic"; Gahn, Reid and Yang

"Curved Film Cooling Admission Tube"; Graham and Papell

"Magnetic Heat Pumping"; Brown

"Method of Forming Oxide Coatings"; McDonald

"Piezoelectric Composite Materials"; Kiraly

"Covering Solid, Film Cooled Surfaces with a Duplex Thermal Barrier Coating"; Liebert

"Ion Sputter Textured Graphite Electrode Plates"; Curren, Forman, Sovey and Wintucky

"Additive for Zinc Electrodes"; Soltis, Sheibley and Nagle

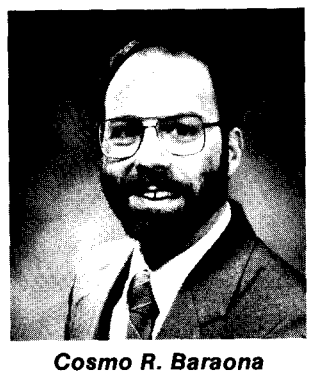
"Ladder Supported Ring Bar Circuit" and "Gyrotron Transmitting Tube"; Kosmahl.

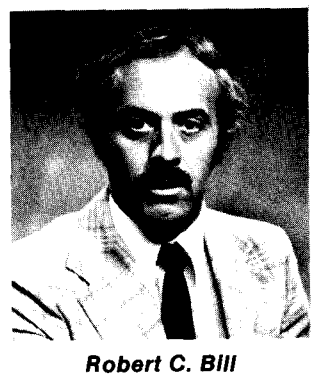
LewisNews

May 4, 1984

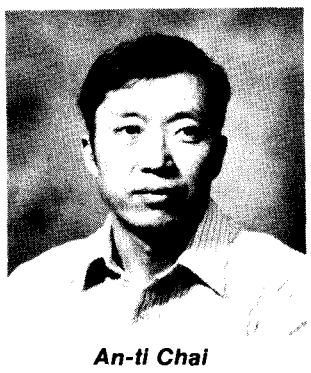
Inventor Awards


Bruce A. Banks


Cosmo R. Baraona

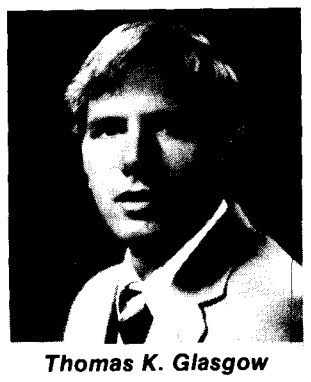

Robert C. Bill


Federick D. Calfo

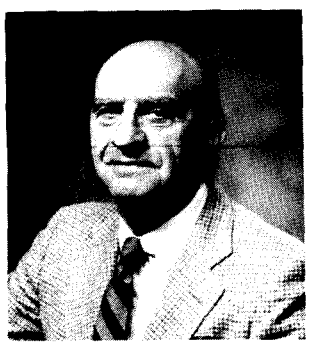

An-ti Chai


Jo Ann Charleston


Michael A. Gedwell


Thomas K. Glasgow


Robert P. Gruber


Henry G. Kosmahl


Stanley R. Levine

At a **Lewis Awareness Inventors Day Ceremony Program** held last month, 32 Lewis inventors/patent holders who have had patents issued in 1984 were honored. Among the honorees was Lynn M. Anderson, who received the Inventor of the Year Award.

In his ceremony remarks, Center Director Andrew Stofan discussed the necessity of securing patent protections. Stofan pointed out that the defensive aspects of Government-owned patents are important because private and public corporations are working on some of the same concepts in which NASA/Lewis is interested. "If we do not secure patent protection, and someone else does, we can be sued for infringement. I am told that current infringement claims against the Government total in excess of a billion dollars."

The Center director also focused on the recent change in viewpoint from the one held years ago that espoused the use of Government-owned patents primarily for defensive purposes. But today, exemplified by the President's pronouncement of the Government Patent Policy in 1971, such patents now also constitute a valuable national resource and should be utilized positively for the general public needs.

In addition, the licensing program of NASA enables Lewis to grant exclusive licenses to small business firms, minority firms and firms in an area of surplus labor so as to provide these firms with a monopoly to aid them to survive and compete in our private enterprise system. To further this concept, Congress passed legislation effective July '81 permitting small businesses to claim first rights in inventions made under Government contracts.

"Although there have been many articles written about the patent system, both pro and con," said Stofan, "history has shown us that other than by patenting, no other satisfactory method of protecting inventions has been found.

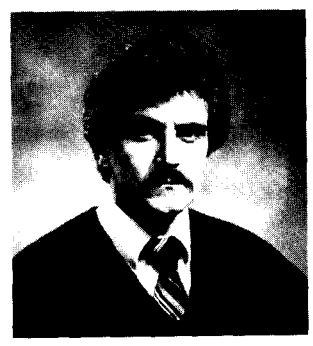
"It is interesting to note that although NASA was formed in 1958—13 years before the President's pronouncement in '71—the sponsors of the NASA legislation recognized that valuable inventions would result from the Space Program as almost one-fourth of the NASA Space Act is devoted to patent provisions and related subject matter," Stofan said. □

(Photos Continued on Page 4)

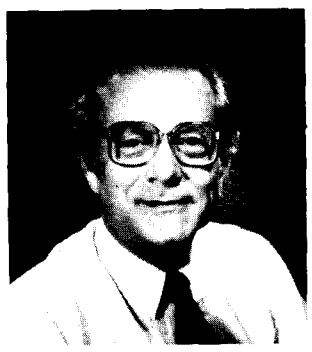
(Photos by Clifford Brooks)

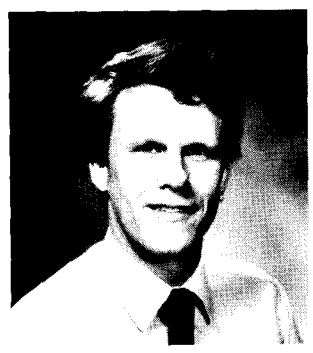

Frances I. Hurwitz


Richard W. Lauver

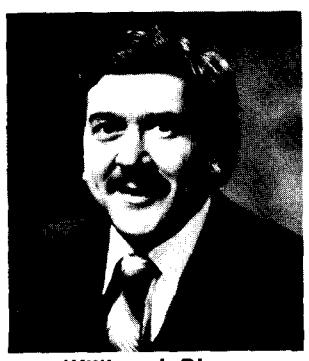

Michael W. Lupton


Michael J. Mirtich


Robert E. Post


Vincent K. Rawlin


Margaret A. Reid


William J. Rice

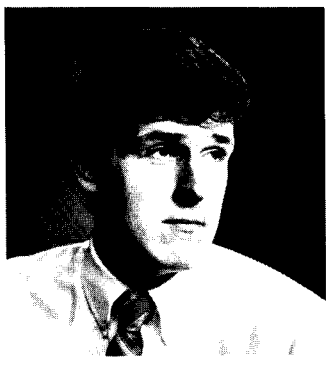

Robert F. Roman


Donald F. Schultz


Daniel G. Soltis

Inventor Awards

Bruce A. Banks



James D. Cawley

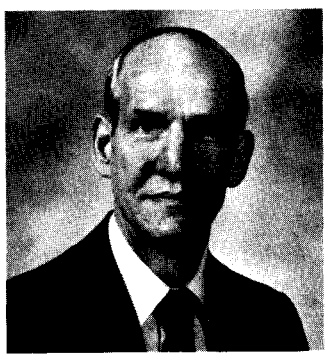
Donald L. Chubb

Robert E. Cunningham

Ben T. Ebihara

David P. Fleming

Randall F. Gahn



Norman H. Hagedorn

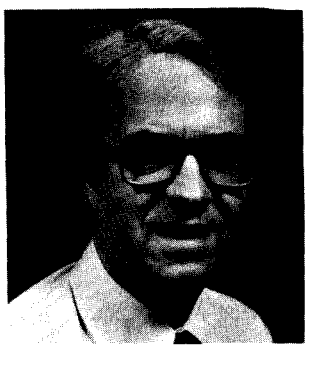
Li Chen Hsu

At recent **Inventors Day Luncheon** program award ceremonies coordinated by the Lewis Awareness Office, 32 Lab inventors who have had patents issued in 1985 were honored on behalf of all the Center inventors, including three Lewis Inventors of the Year—**Randall F. Gahn** and **Norman H. Hagedorn** of the Power Technology Division (who share a patent), and **Leonard J. Westfall** of the Materials Division. At the April 17 event, Chief Counsel **William H. Brahms** presented the inventors and Center Deputy Director John M. Klineberg offered congratulations and the award plaques and also discussed the importance of patents in providing a valuable national resource. Pictured here are the attending Inventors Day awarded patentees.

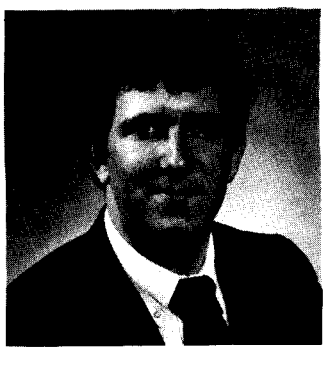
Richard W. Lauver

Michael J. Mirtich

Ruth H. Pater

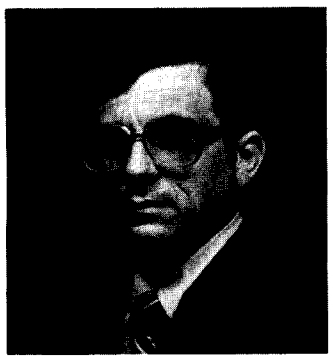


Warren H. Philipp



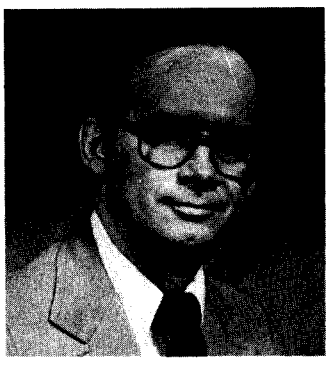
George C. Rybicki

Olga D. Gonzalez-Sanabria

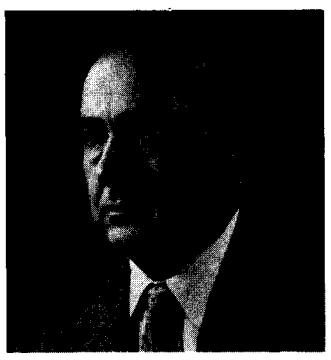


Dean W. Sheibley

James L. Smialek

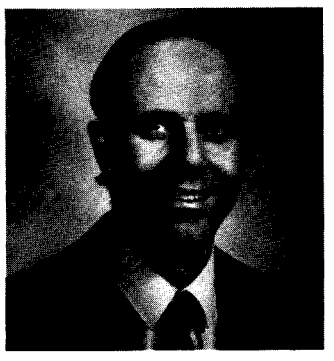


James S. Sovey



Stephan Stecura

Edward L. Warren



Leonard J. Westfall

During the annual Inventors Day Awards Ceremony April 10, Bruce Banks (left), chief, Electro-Physics Office, Power Technology Division, and staff member Sharon Rutledge were two of the 18 inventors who received plaques from Acting Director Dr. John Klineberg. The plaques featured embossed replicas of the front pages of their patents.

Eighteen Researchers Honored At Inventors Day Awards Ceremony

Eighteen Lewis scientists and engineers, whose projects were patented in 1986, were honored at the 12th Annual Inventors' Day Award Ceremony April 10.

Acting Director Dr. John Klineberg and Chief Counsel William Brahms presented each inventor with a plaque featuring an embossed replica of the first page of his or her patent. Three of the Lewis inventors had more than one patent granted in 1986.

The awards ceremony, coordinated by the Lewis Awareness Office, followed a luncheon in the small dining room.

The eighteen researchers honored, their divisions, and the titles of their inventions are:

- **Bruce Banks,** chief, Electro-Physics Office, Power Technology Division, "Apparatus for Producing Diamondlike Carbon Flakes," "Apparatus for Producing Oxidation Protection Coatings for Polymers," and "Ion Beam Sputter Etching";
- **Charles Barrett,** Materials Division, "Nickel Base Coating Alloy";
- **Dr. Henry Brandhorst, Jr.,** chief, Power Technology Division, "Lithium Counterdoped Silicon Solar Cell";
- **Arthur Curren,** Space Communications Division, "Textured Carbon Surfaces on Copper by Sputtering";
- **Eliseo DiRusso,** Structures Division, "Variable Friction Secondary Seal for Face Seals";
- **Randall Gahn,** Power Technology Division, "Method and Apparatus for Rebalancing a Redox Flow Cell System";
- **Kenneth Jensen,** Test Installations Division, "Textured Carbon Surfaces on Copper by Sputtering";
- **Dr. Henry Kosmahl,** Analex, "Linearized Traveling Wave Amplifier with Hard Limiter Characteristics";
- **Carl Lowell,** deputy chief, Materials Division, "Nickel Base Coating Alloy";
- **Charalampus Marinos,** FMC Corporation, "Heat Exchanger for Electrochemical Devices";
- **Michael J. Mirtich, Jr.,** Power Technology Division, "Apparatus for Producing Oxidation Protection Coatings for Polymers," "Heat Exchanger for Electrochemical Devices";
- **Paul Penko,** Space Propulsion Technology Division, "Heat Exchanger for Electrothermal Devices";
- **Robert Roman,** Test Installations Division, "Textured Carbon Surfaces on Copper by Sputtering";
- **Sharon Rutledge,** Power Technology Division, "Ion Beam Sputter Etching";
- **John Smithrick,** Power Technology Division, "Oxygen Recombination in Individual Pressure Vessel Nickel-Hydrogen Batteries";
- **James Sovey,** Space Propusion Technology Division, "Apparatus for Producing Oxidation Protection Coatings for Polymers,"and "Heat Exchanger for Electrothermal Devices";
- **Dr. Irving Weinberg,** Power Technology Division, "Lithium Counterdoped Silicon Solar Cell"; and
- **Ralph Zavesky,** Space Experiments Division, "Heat Exchanger for Electrothermal Devices."

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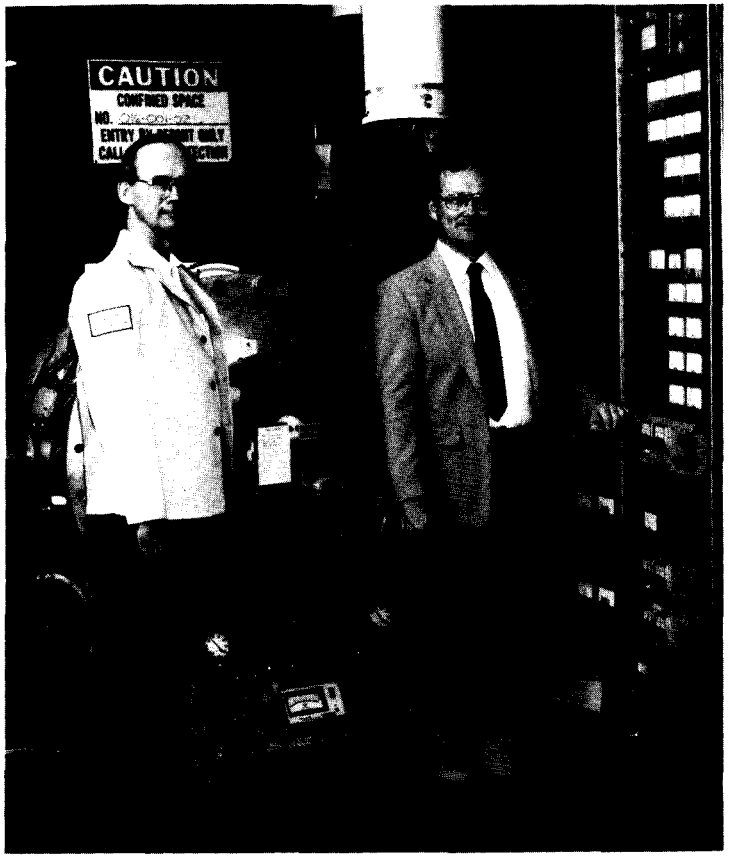
Lewis Research Center Volume 24 Issue 13 June 26, 1987

LewisNews



This ion beam sputtering system in Bldg. 16 is used to develop codeposited metal oxide fluoropolymer atomic oxygen protective coatings. "Oxidation Protection Coatings For Polymers" is the newest Lewis invention to be patented. Shown above are two of its three inventors: (left) James Sovey, Space Propulsion Technology Division, and Bruce Banks, chief, Electro-Physics Office, Power Technology Division. Not pictured: Michael Mirtich, also of the Electro-Physics Office.

Newly Patented Thin-Film Coating Will Help Protect Space Station

A lightweight, flexible, thin film coating designed to protect polymers from oxidation is the most recent Lewis invention to be patented. A patent for "Oxidation Protection Coatings For Polymers" was granted May 12.

The coating was invented by Bruce Banks, chief, and Michael Mirtich, of the Electro-Physics Office, and James Sovey, of the Space Propulsion Technology Division.

The new coating enables polymers used as thermal and structural blankets in spacecraft to retain their properites during long periods of exposure to the atomic oxygen in low-Earth orbit. The coated polymers will help ensure the durability of the Space Station.

For example, one type of polymer, polyimide, is typically used as a blanket material in solar arrays. Without protection, over years of exposure, the polymer would become so thin that it would cause the Space Station's power system to fail.

The protective coating is a molecular mixture of metal oxide and polymeric material deposited by ion beam sputtering on a clean polymer surface. The metal oxide in the coating protects the polymer by providing an already oxidized surface. The polymeric material in the coating makes the thin film flexible and resistant to cracking. The coating can be a mix of one or more metal oxides and/or polymers in a variety of ratios.

The advantage of this oxidation protection technique is that it does not substantially change the mechanical, optical, electrical, thermal, and bonding properties that make Kapton® polyimide more desirable in spacecraft design than silicon rubber or other materials.

Banks began work on the invention in 1978. In addition to extensive ground tests, thin film coatings were tested aboard the Space Shuttle in 1983. Coatings of aluminum oxide, silicon dioxide, and 96% silicon dioxide with 4% fluoropolymer were found to be effective in protecting Kapton® during 41 hours of exposure to the Space environment during STS-8.

How Would You Rate Your Boss? Part II

Power Technology Division employees are evaluating the performance of supervisors

The August issue of Working Smarter described how wage grade employees in the Test Installations Division are using a questionnaire to evaluate the performance of their supervisors.

Since then, researchers, secretaries, and administrative support personnel in the Power Technology Division have also been given the opportunity to evaluate their supervisors. While there are many similarities between the two subordinate appraisal programs, there are also many differences.

Initiated At Closing The Loop

The idea for subordinate appraisal of supervisors within the Power Technology Division was first suggested at a Closing the Loop participative management training session in October 1986.

In December, a committee was formed to propose such a system. The objective was to provide a mechanism that would give supervisors constructive feedback from their employees in order to increase management effectiveness and overall Division productivity.

The committee was chaired by Bruce Banks, chief, Electro-Physics Office, and included Dr. Sheila Bailey, Dr. Patricia O'Donnell, Marla Perez-Davis, and Dr. Joseph Singer.

Before establishing basic appraisal guidelines, the committee studied literature about the concept and consulted a widely recognized expert—Dr. H. J. Bernadin, a management professor at Florida Atlantic University. The committee also consulted with the Training and Development Branch, the Office of Chief Counsel, and the Computer Services Division.

Protecting Anonymity

To make sure the feedback to the branch chiefs and their deputies would be genuine and unreserved, the committee felt strongly that the forms should be submitted anonymously and tabulated by a neutral, external third party.

The committee also opted not to include open-ended questions as a means of preserving anonymity. Since branch chiefs and deputies are generally familiar with the writing styles of each employee, it's possible that a respondent could be identified by how his or her comments were phrased.

In addition, the committee recommended developing two separate appraisal forms: one for use by researchers and one for use by secretaries and other administrative support personnel. To protect the anonymity of secretaries (because there is only one per branch), the committee decided to aggregate the responses from the secretaries and other support staff.

The committee also recommended using frequency

responses (i.e., Always, Usually, Sometimes, Seldom, Never) instead of a 1 to 5 scale, because different numbers can mean different things to different people. A "Not Applicable" space was also included.

Developing Questions

A great deal of time, effort, and employee input went into developing the specific questions and determining how many questions should be included.

As a first step, the committee selected a list of 18 "Dimensions of Managerial Performance" to define the areas in which supervisors should be appraised. The list included responsibilities such as: planning, guiding subordinates, technical proficiency, persistence in reaching goals, handling crises, maintaining good working relationships, representing the organization to the public, and monitoring and controlling resources. The committee made sure that the appraisal questions covered all 18 areas and related only to aspects of supervisory performance that are within the supervisor's control and capability to improve.

Before finalizing the subordinate appraisal form, the committee sought comments on the questions from: all the employees and supervisors within the Division; LESA (IFPTE Local 28); the Training and Development Branch; and Division Chief Dr. Henry Brandhorst, Jr. After getting the go-ahead to proceed, the committee contracted with Case Western Reserve University to conduct the survey.

Conducting The Appraisal

The subordinate appraisal forms were distributed to all civil service employees in the Division the last week in September. Responses were due October 9. Completed forms were returned from 63 percent of the employees who received them.

The forms for secretaries and administrative support personnel covered 47 specific concerns, including the supervisor's performance in: goal-setting; meeting deadlines; using criticism constructively; providing regular feedback on performance; making an effort to understand the subordinate's strengths, weaknesses, and career goals; keeping employees informed; being accessible; showing respect for employees' opinions; consulting individuals who will be affected before making final decisions; and securing promotions for deserving individuals.

The form distributed to scientists and engineers covered an additional 13 research-oriented aspects of the supervisor's performance. For example, researchers were asked how often their super visors encourage them to: publish; interface with researchers outside NASA, and attend technical meetings.

Using The Feedback

"What is done with the feedback will determine whether this was a worthwhile exercise," emphasizes Banks. While the subordinate appraisal is not part of the supervisor's formal performance review, each supervisor is expected to make a deliberate effort to improve in those areas identified as weaknesses.

Each supervisor will receive a scoresheet showing the mean score and total number of responses received from his subordinates for each statement. Each supervisor will also be able to see how the other supervisors were rated, although the supervisor won't be able to identify which other supervisor received which score.

Supervisors are then expected to meet with their subordinates to review the results to get further feedback.

To ensure that supervisors make legitimate efforts to address identified areas of concern or need, Branch chiefs will discuss the results with the Division chief and deputies will discuss the results with the Branch chiefs and the Division chief. The results of the aggregate appraisal of the Division support stafff will be reviewed in a meeting of the Division chief with the Branch chiefs.

After nine months, CWRU will send up a follow-up appraisal form to Division employees to determine whether the supervisor has in fact improved.

"As with any new concept, there is generally some initial skepticism," says Banks. "Once people see that this system is working and that improvements are being made, we believe that the number of Division employees participating in future appraisals will be even higher."

Aerospace Technology Directorate Uses PIQE Planning To Improve Organizational Effectiveness

Based on widespread employee input, four PIQE thrusts have been recommended

For the Aerospace Technology Directorate, efforts to improve productivity are not new. As research programs grow and change, the Directorate continually strives to maximize its organizational effectiveness.

For example, in 1985 the Materials Division conducted a pilot program for white collar productivity improvement in an R&D organization. And, Sal Grisaffe, chief of the Materials Division, has regularly sent out forms requesting employee feedback on the strengths and weaknesses of Division-level management.

When a Center-wide Productivity Improvement and Quality Enhancement (PIQE) program was announced last year, Dr. J. Stuart Fordyce, director of Aerospace Technology, saw it as a way to formalize and consolidate the many efforts already underway.

An Aerospace Technology Directorate PIQE Planning Committee was formed, chaired by Bruce Banks, chief, Electro-Physics Office, Power Technology Division. Other members were: Charles Lawrence, Structures Division; Charles Raquet, Space Electronics Division; John Schubert, Space Propulsion Technology Division; and Carl Stearns, chief, Environmental Durability Branch, Materials Division.

Employee Input

To gather suggestions from employees, the Aerospace Technology PIQE Planning Committee first developed a one-page "Solicitation of Input for Productivity Improvement and Quality Enhancement Ideas." The form asked employees to list any productivity problems or quality-related needs that could be resolved by actions within the Center's authority.

Division chiefs within the Directorate sent the forms to all employees within their Divisions. The forms were then returned to the Branch chief for evaluation.

In addition to compiling all the suggestions, each Branch chief was asked to:

- rpropose PIQE thrusts ther Branch would be willing to support or initiate;
- rdocument Branch activitiesr already being undertaken to improve productivity and quality; and
- ridentify Branch activities thatr could either be eliminated or performed by another organization to allow a more productive use of available time.

Prioritizing Thrusts

The committee then narrowed down the dozens of suggested PIQE thrusts into a more workable number. Potential PIQE thrusts were considered to be not just new activities that could be undertaken, but also activities that could be eliminated or transferred.

Each committee member scored each proposed PIQE thrust on a range from 0 ("counter-productive") to 4 ("extremely worthwhile"). The scores were tabulated to determine which ones were considered to most worthwhile. To make sure that the priorities established by the PIQE committee accurately represented the views of a majority of Direcorate employees, feedback on the highest ranking thrusts was solicited from scientists and engineers throughout the Direcorate.

The committee then re-scored the proposed thrusts—not just on the value of the proposed ideas but also on the feasibility of its implementation.

"Priorities changed considerably during this phase," said Banks. "Some ideas that had a great deal of merit were found to be too broad and vague to quantifiably develop steps for implementation. On the other hand, some ideas that were initially viewed as of moderate value were found to be easily workable."

PIQE Thrusts

The committee recommended four PIQE thrusts for Directorate-wide implementation.

One thrust proposes providing a "safe reserve" fund that can be used during the second half of the fiscal year for purchases under $10,000. Currently, the Directorate commits all funds early in the fiscal year; consequently, researchers are told that funds aren't available for small purchases they needed to overcome unanticipated research problems later in the year. This proposed thrust was selected because this aggravating and disruptive problem which affects a number of employees can probably be easily resolved.

Another thrust calls for rewarding those who implement and accomplish projects as well as those who "sell" them. The Aerospace Technology Directorate PIQE Planning Committee found that there is a widespread feeling within the Directorate that recognition and rewards for actually accomplishing the work should receive greater emphasis.

The PIQE Planning Committee presented its proposed thrusts to the Directorate Management Council in October. All four proposals were accepted. At this stage, the PIQE Planning Committee has completed its work.

"The Division chiefs and I have taken full personal responsibility for the follow up," says Dr. Fordyce. "We are now developing action plans to address the selected thrusts."

Banks is proud of the PIQE Plan that was developed: "The process involved widespread input and objective evaluations of the ideas. The end result is not a mandate from above, but an expression of changes our employees would like to see made."

NASA
National Aeronautics and Space Administration
Lewis Research Center Volume 25 Issue 10 May 13, 1988
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Twelve Inventors Honored At Luncheon

Twelve current or retired Lewis employees whose inventions were patented in 1987 were honored at the 13th Annual Inventors' Day Award Ceremony, April 19 in the small dining room.

Center Director Dr. John Klineberg and Acting Chief Counsel Joseph Saggio presented each inventor with a plaque featuring a replica of the first page of his patent.

The titles of the inventions and the names of the inventors honored are listed below.

- **"Precision Tunable Resonant Microwave Cavity"**—Shigeo Nakanishi, retired; Frank Calco, Structural Systems Division; and August Scarpelli, Fabrication Support Division.
- **"Oxidation Protection Coatings for Polymers"**—James Sovey, Space Propulsion Technology Division; Bruce Banks, chief, and Michael Mirtich, Electro-Physics Office, Power Technology Division.
- **"Heat Treatment for Superalloy"**—Fredric Harf, Space Experiments Division.
- **"Method of Preparing Fiber Reinforced Ceramic Material"**—Ramakrishna Bhatt, Propulsion Directorate, U.S. Army Aviation Research and Technology Activity.
- **"Ion-Beam Nitriding of Steels"**—Joshua Salik, retired; and Theodore Hubbell, Test Installations Division.
- **"Apparatus for Mounting a Field Emission Cathode"**—Ben Ebihara, Space Electronics Division; and Ralph Forman, retired.

Theodore Hubbell (right), who retired from the Test Installations Division this month, was one of 12 employees honored at the 13th Annual Inventors' Day Award Ceremony. Center Director Dr. John Klineberg (left) presented Hubbell and other inventors with replicas of the first pages of their patents.

At the Inventors' Day ceremony, Dr. Klineberg emphasized how important it is for Lewis researchers to apply for patents. If other organizations patent technology similar to that developed here, NASA must pay for the rights to use that technology.

Inventors To Share Royalties

As a result of amendments to the Technology Innovation Act, Lewis inventors have an excellent incentive to submit invention disclosures. If a patented invention is licensed for commercial use, the inventors or co-inventors may receive up to $100,000 a year in royalties for each year of the license.

NASA's policy for distribution of royalties to inventors is included in a NASA Management Instruction issued last October that covers "Inventions Made By Employees Under NASA Administrative Jurisdiction" (NMI 3450.2B). Some of the key points of the policy are summarized below:

- For each fiscal year under each license, the inventor will receive the first $2,000 accumulated. If more than one inventor is listed on the patent, the co-investors will share the first $2,000.
- In addition, each inventor or co-inventor will receive 20 percent of the royalties or other income in excess of the first $2,000. If there are more than five co-inventors, the amount in excess of the first $2,000 will be distributed on an equal share basis.
- The distribution of royalties or other income to any one inventor shall not exceed $100,000 per year, unless the President approves a larger amount.
- The distribution of royalties to inventors will continue regardless of any change in the inventor's employment status.

National Aeronautics and Space Administration

Lewis Research Center

June 10, 1988

Banks, Shaltens Win Tech Transfer Awards

Bruce Banks, chief of the Electro-Physics Office, and Richard Shaltens, a project manager in the Stirling Technology Branch, were among 30 Federal employees nationwide selected to receive Awards for Excellence in Technology Transfer from the Federal Laboratory Consortium (FLC).

The Federal Laboratory Consortium is a network of more than 300 federal laboratories that was formed in 1974 to help transfer federally developed technology to the public and private sectors. Each laboratory that belongs to the FLC may nominate two employees each year to compete for the 30 awards. Banks and Shaltens were nominated by the Center's FLC representative, the Technology Utilization Office, and received the awards May 17 in Washington, DC.

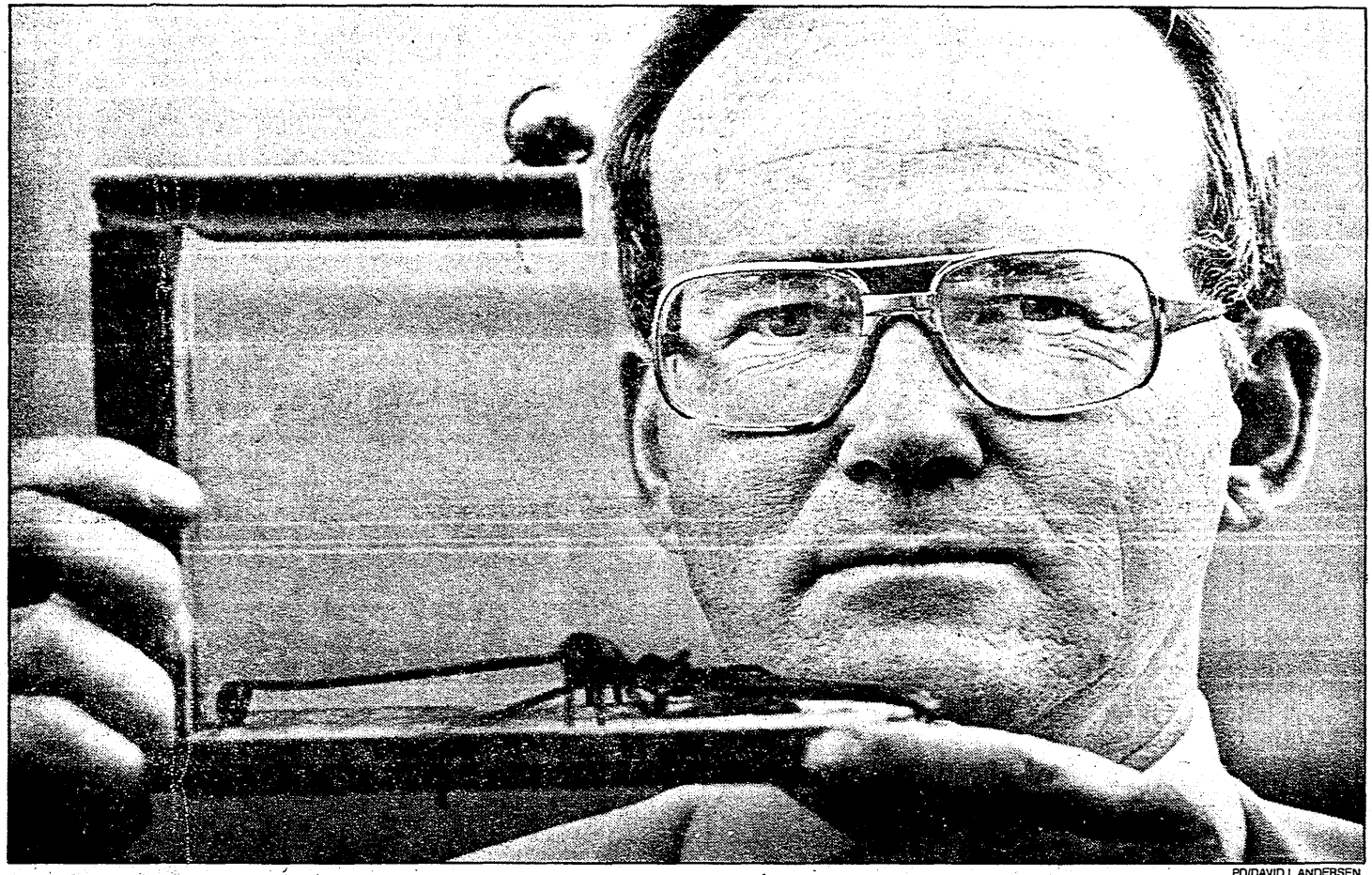
Bruce Banks (left) and Richard Shaltens were among 30 Federal employees nationwide to receive Awards for Excellence in Technology Transfer from the Federal Laboratory Consortium.

Banks won the award for his work in promoting the use of intercalated graphite composites by industry. Graphite fiber composites are used in a variety of products from aircraft components to sports gear. Intercalation, a process that inserts "foreign" molecules into the graphite crystal structure, can improve the electrical conductivity of those fibers.

Banks led a team of scientists in solving technical problems associated with intercalation and addressed such commercial issues as scaling up production quantities, identifying new and existing products that could be improved through the application of this new technology, and building and testing prototype products.

Shaltens was recognized for his efforts to transfer NASA-DOE Stirling engine technology to the automotive industry. Since the late 1970s, NASA has been interested in Stirling technology for space power applications. DOE-funded research into automotive Stirling technology has meshed well with NASA's long-range space power objectives. The overall goal of the automotive program is to develop a cost-competitive, multifuel power plant with reduced emissions (without a catalytic converter), and improved fuel economy without a decrease in performance.

To respond to skeptics who say the performance data gathered under ideal laboratory conditions doesn't reflect the real world, Shaltens planned a demonstration program in which Stirling-powered commercial vehicles are being driven by non-technical personnel. For example, a Stirling-powered pick-up truck has been in operation in regular service at various Air Force bases throughout the United States. And, a Stirling-powered postal van is being prepared for daily operation on a postal route in the northern Virgina area.



PD/DAVID I. ANDERSEN

Bruce Banks and his better mousetrap. "I'm not smarter than anyone else, but I'm a lot more determined," says the Olmsted Township inventor, who has 24 patents under his name for his inventions.

Curiosity led to invention of better trap

By JOHN FREEH
STAFF WRITER

People often talk about the better mousetrap, but few actually build one.

Meet Bruce Banks, chief of electro-physics at NASA's Lewis Research Center, award-winning inventor with 24 patents and a builder of a better mousetrap.

Banks once made an electronic trap designed to capture rather than kill a mouse that had found its way into his Olmsted Township home. When the rodent avoided the snare, Banks left a standard trap. But the mouse ate around the bait and escaped unharmed.

"I couldn't figure out what I was doing wrong," Banks said. "I had to come up with a new way to skin a cat, so to speak."

'I had to come up with a new way to skin a cat, so to speak.'

— Bruce Bankss

After much thought, he put a thumbtack under the center of the trap's rectangular base and rigged the device to an overhead wooden frame that held a ball bearing. When the mouse stepped on the end of trap, the base tilted, releasing the ball bearing, which fell on the trap and triggered the spring.

The mouse never saw it coming, Banks said.

The example illustrates Banks' stubbornness, which he contends is the hallmark of any good inventor. "I'm not smarter than anyone else," he said," but I'm a lot more determined."

That determination has led to scores of inventions, most of which have applications for NASA's space program.

In 1986, for example, Banks, 46, patented a process called ion beam sputter etching, which alters the surfaces of materials. The process may be used to protect the space shuttle's solar power cells from the damage

SEE INVENT/5-D

Invent

FROM/1-D

of oxidation, but it has biomedical applications, such as increasing the durability of surgical implants.

Another of Banks' patents is a silicon shunt, or tube, which helps drain spinal fluid from the part of the brain that produces it. In those suffering hydrocephalus, improper drainage builds up fluid and can lead to a host of problems, such as nausea, headaches and faulty vision. Untreated, the condition is fatal.

Banks said the shunts now used have large holes that often clog and prevent proper drainage. His patented shunt, which measures one-eighth-inch in diameter, has thousands of tiny holes, each the width of about four hairs. The number and size of the holes makes them less likely to clog, he said.

Westlake-born Banks always dreamed of working for NASA. "My childhood was atypical," he said. "Not too many kids have home laboratories."

Banks is a graduate of Rocky River High School, Case Institute of Technology and the University of Missouri's graduate school.

He describes himself as unusually curious.

Most people never wonder, for example, why tapping the bottom of a glass filled with malted milk produces a hollow sound; or why thermometers show the patient's temperature after being removed from the mouth; or why sheets left to dry on a clothesline feel cooler than those run through a dryer.

Intrigued by the latter phenomenon, Banks went to his back-yard clothesline with a magnifying glass. His findings: Drying sheets on the line lets fabric fibers settle more evenly, which allows for greater density; and denser material always feels cooler to the touch.

Banks, whose outside interests include scrimshaw and silversmithing, said his best ideas come between 4 and 5 in the morning. He keeps a pad by his night table to write them down. He said he can't forget about a technical problem until he finds the solution.

Despite his success as an inventor, Banks said he has no thought of leaving NASA to sell or develop some of his patents, a venture that might be worth thousands of dollars. Under current law, NASA owns patents developed by its employees, but new regulations allow inventors to share in the proceeds when patents are sold.

Banks said he appreciates NASA's corporate philosophy, which values creativity and tolerates mistakes in research and development.

Chief Of Electro-Physics Office Receives Award For Excellence

Bruce Banks, chief of the electro-physics office, has received the Award for Excellence in Technology Transfer from the Federal Laboratory Consortium. He was honored "for his efforts to transfer intercalated graphite fiber technology to private industry and develop new commercial products using this material."

Banks led a team of scientists that solved technical problems associated with intercalation and investigated commercial issues such as scaling up production quantities, identifying new and existing products that could be improved through the application of this new technology, and building and testing prototype products.

The electro-physics office studies space power materials, surfaces, and coatings.

Lewis Experiment Flown On STS-32

Researchers in the Power Technology Division watched the STS-32 mission of Columbia with great interest and excitement.

In addition to having three experiments aboard the Long Duration Exposure Facility (LDEF) retrieved by the Columbia crew (see page 4), the Power Technology Division also had an experiment flown aboard the orbiter, which was launched Jan. 9.

Bruce Banks, chief of the Electro-Physics Branch, said Lewis was invited in September to submit samples for exposure to the space environment. He jumped at the chance and assembled a team that prepared the experiment within a two-week deadline.

The team included Sharon Rutledge, Kim de Groh, and Curtis Stidham, with the support of students from Cleveland State University. For de Groh and Stidham, it was their first experiment to be flown aboard the shuttle.

The experiment tested 10 specimens, including state-of-the-art atomic oxygen protective coatings. The coatings are designed to protect solar arrays and solar concentrator surfaces on Space Station Freedom from degradation by the space environment.

The specimens were flown in a sample holder in Columbia's cargo bay and were exposed to the space environment while the cargo bay was opened to be cleaned by the environmental atomic oxygen before the LDEF was retrieved.

The results of the experiment will: 1) help determine the effects of the space environment on the most recently developed protective coatings; and 2) help verify the accuracy of ground-based studies of the durability of solar array blankets considered for use on Space Station Freedom.

Lewis Experimenters Eagerly Await Return Of LDEF

One of the highlights of the STS-32 mission was the successful recovery of the Long Duration Exposure Facility (LDEF). Placed in orbit in April 1984, the LDEF is a critically important spacecraft designed to test the performance of spacecraft materials, components, and systems that have been exposed to the space environment for a long time. The unprecedented data gathered by the LDEF will be invaluable in the design of future spacecraft, including Space Station Freedom.

When the LDEF is returned to Kennedy Space Center (KSC) in February, several Lewis researchers will be eagerly waiting to examine it.

Michael Mirtich and Bruce Banks, of the Power Technology Division, are responsible for the Ion-Beam-Textured and Coated Surfaces Experiment. Their experiment was designed to test the durability and performance of 36 Lewis-designed thermal coatings and materials, including coatings used on solar array blankets for Space Station Freedom.

Mirtich notes that because of the orientation of the LDEF and strategic placement of each experiment aboard the spacecraft, researchers will, for the first time, be able to study the directionality of the micrometeroids, space debris, atomic oxygen, and other elements of the space environment.

Another Lewis-originated LDEF experiment is The Advanced Photovoltaic Experiment, initiated by Dr. Henry Brandhorst and Americo "Moe" Forestieri. The experiment, which has since been assigned to Dr. David Brinker of the Power Technology Division, was primarily designed to evaluate the performance of 136 different designs of advanced and conventional solar cells.

The Solar-Array-Materials Passive LDEF Experiment was designed by Dr. Brandhorst and Forestieri in conjunction with researchers from Marshall, Goddard, and the Jet Propulsion Laboratory. The objective of this experiment is to evaluate the synergistic effects of the space environment on various solar-array materials.

NASA had originally planned to retrieve the LDEF after 11 months in space. But primarily because of delays following the Challenger accident, the spacecraft remained in orbit for more than five years. For almost all of the experiments, the delay in retrieval will provide an even greater understanding of the degradation of materials in the space environment.

But the LDEF would not have remained in space much longer. An unexpected increase in solar activity led scientists to predict that LDEF would reenter the Earth's atmosphere early this year and be destroyed. To preserve the extremely valuable data gathered by the LDEF, NASA juggled the shuttle flight schedule to retrieve the LDEF as soon as possible.

The Long Duration Exposure Facility (LDEF), the first spacecraft designed to place experiments in space for a long period of time and return the experiments to Earth, was delivered to in orbit April 7, 1984 by Space Shuttle Challenger (above). Roughly the size of a small schoolbus, the LDEF was retrieved Jan. 12 by the crew of STS-32 aboard Columbia.

Lewis researchers played key roles in three of the 57 experiments carried aboard the LDEF. One of the Lewis experiments, The Advanced Photovoltaic Experiment, appears as the dark, solid black panel in the center of the top row of the LDEF (top).

In February, the Lewis experimenters will examine their experiment trays before they are removed from the LDEF and shipped back to Lewis.

As members of LDEF special investigating groups, Banks and Mirtich had briefed the Columbia astronauts about what effects to look for during their in-space inspection of the LDEF.

"The LDEF is one of NASA's most important space experiments," says Mirtich. "The synergism of all the elements of the space environment is virtually impossible to duplicate on Earth."

Lewis Employees Named OAI Adjunct Faculty

Sixty-one Lewis scientists and engineers have been appointed adjunct faculty members of the Ohio Aerospace Institute (OAI). In this role, they may be asked to mentor graduate students, serve on graduate thesis committees, and contribute to OAI's academic offerings.

And, 200 instructors from the nine Ohio universities that belong to the OAI consortium have been named collateral faculty. In addition to mentoring students and teaching, they will write proposals for research.

The selection of faculty represents a major milestone in the development of the OAI which was incorporated in 1989 to provide new opportunities for graduate and continuing education, collaborative aerospace research, and technology transfer. The OAI is operated by consortium that includes: Lewis, the Air Force Wright Research and Development Center, regional aerospace and high-technology industries, and nine universities. The universities are: Case Western Reserve, Cleveland State, Ohio, Ohio State, and Wright State Universities and the Universities of Dayton, Akron, Cincinnati, and Toledo.

Special Assistant to the Director Bill Brainard, who laid much of the groundwork for the OAI, said, "We are pleased that so many outstanding Lewis scientists and engineers will be assisting the OAI. They will do a tremendous job in helping graduate students receive the very finest education possible in the aerospace field."

OAI Adjunct Faculty Members

The OAI Adjunct Faculty represents a cross-section of scientific and engineering disciplines at Lewis.

Office of Chief Scientist
Marvin Goldstein
John Ferrante
Robert Siegel
Reda Mankbadi
Lennart Hultgren

Office of Mission Safety and Assurance
Vincent Lalli

Computer Services Division
James Pennline
Janeal Oprea
Jay Horowitz

Engineering Directorate
Ronald Graham

Space Station Freedom Directorate
Larry Viterna

Aeronautics Directorate
Mary Zeller
Neil Van Dresar
Richard Seasholtz
Ten-Huei Guo
Walter Merrill
Louis Povinelli
Meng-Sing Liou
Chi-Rong Wang
David Bittker
Frank Zeleznik
Mark Potapczuk
Colin Drummond
Daniel Hoyniak
John Lytle

Aerospace Technology Directorate
J. Stuart Fordyce
Hubert Probst
Arnon Chait
Mohammed Kassemi
Ivan Locci
Gary Roberts
Kenneth Bowles
Mary Ann Meador
Suleyman Gokoglu
James Smialek
Robert Miner
Christos Chamis
Steven Arnold
Gary Halford
Alan Freed
Charles Lawrence
Edward Generazio
Bryan Palaszewski
Valerie Lyons
Samuel Alterovitz
Aloysius Hepp
Donald Chubb
Sheila Bailey
Brian Good
Geoffrey Landis
Harvey Bloomfield
Willie Mackey
James Gaier
Bruce Banks
Kul Bhasin

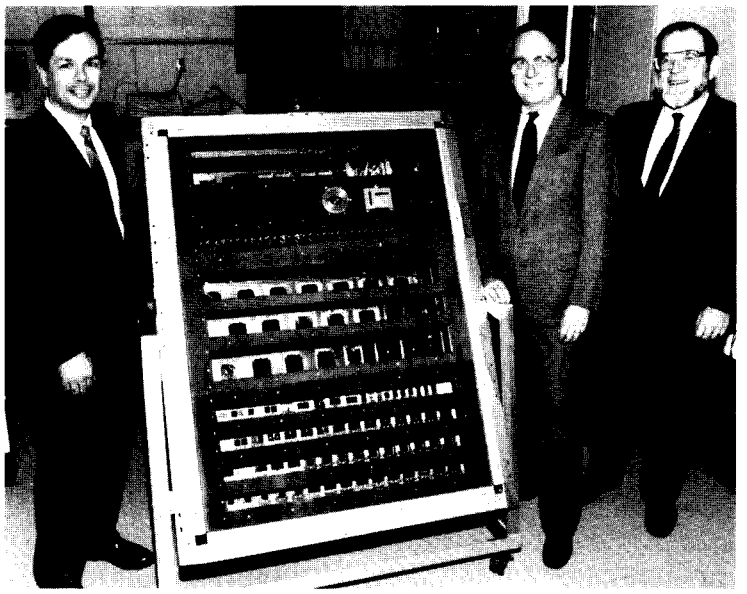
Space Flight Systems Directorate
Robert Manning
Jon Freeman
Mohammed Hasan
Neil Van Dresar
R. Balasubramaniam
Allen Wilkinson

Volume 27 Issue 8 April 13, 1990

Lewis News

PRECIOUS CARGO: After nearly six years in space, the Advanced Photovoltaic Experiment was returned to Lewis March 14. The experiment was one of two Lewis-led experiments carried aboard the Long Duration Exposure Facility that was deployed by the orbiter Challenger in April 1984 and retrieved by the orbiter Columbia in January of this year. Shown here (left to right) Roy Coe of the Aircraft Maintenance Branch, Jeff Cook of MSI, and Principal Investigator David Brinker of the Power Technology Division prepare to unload the crate containing the experiment package from NASA 5. The plane arrived from Kennedy Space Center where Dr. Brinker and Dr. Dennis Flood, chief of the Photovoltaic Branch, had inspected the experiment before it was prepared for shipping.

The other experiment led by Lewis investigators, the Ion-Beam Textured and Coated Surfaces Experiment, was also returned to the Center in March. That experiment was conducted by Bruce Banks, chief of the Electro-Physics Branch, and Michael Mirtich, Power Technology Division.



LEFT: The Advanced Photovoltaic Experiment was displayed in Bldg. 302 before it was dismantled for further study. The experiment package, which contained over 150 solar cells, was on the leading edge of the LDEF spacecraft as it completed more than 32,000 orbits around the Earth. Dr. Brinker (left) said it's too soon to tell how the performance of the cells was affected by the extended space flight, but some surface wear and tear was evident. The experiment package showed the impact of space debris, some cell contamination, and a micrometeorite hit.

Among those who viewed the experiment package were: Director of Space Station Freedom Ron Thomas (second from right), Director of Aerospace Technology Dr. J. Stuart Fordyce (right), Center Director Dr. John Klineberg, and the originators of the experiment Power Technology Division Chief Dr. Henry Brandhorst and Director of External Affairs Americo "Moe" Forestieri.

Lewis Focuses On Excellence

Group Awards for the Second Half of 1991

A Group Achievement Award is presented to a group of employees in recognition of outstanding teamwork, effort, and accomplishment in which the contribution cannot be identified with any one individual. The following list acknowledges those individuls whose contributions earned a Group Achievement Award. The names of the recipients of Special Act or Service (SAS) Awards and Sustained Superior Performance (SSP) Awards will be published in upcoming Lewis News *issues.*

Successful SSF Restructure

0151 Carl F. Weegmann
0151 Timothy D. Best
0151 Frank Robinson, Jr.
0152 Martha S. Wetherholt
0152 Edward J. Zampino
0152 Robert J. Makovec
0152 John A. Andrasik
0152 Bruce Beam
0152 Michael L. Ciancone

Office of Chief Counsel Secretarial Support Team

0120 Bernadette M. Baldwi
0120 Janis B. Cimber
CRTZ Rachel Venezuela

Patent Staff

0120 Mildred C. Hutchinson
0120 James A. Mackin
0120 Gene E. Shook

Exemplary Work Effort by PCO Staff

1340 Suzanne E. Aldrich
1340 Bonita J. Tufts-Davis
1340 Louise A. Tupper
1340 Olga L. Rodriguez

Summer ADP Training Preparation Team

1012 Carole A. Demongeot
1022 Joann Charleston
1310 Sandra L. Nagy
1310 Mildred J. Bergman
1310 Pamela J. Plencner
CSUC Annette M. Rostettler
CSUC Sherri A. Gaul
OMNI Suzan I. Smith
SVER Susan E. Gardner

Hydrogen Arcjet Life Test Facility Team

5330 Earl Morren
5330 Luis R. Pinero
5330 Thomas W. Haag
5350 Stanley P. Grisnik
5350 Elmer R. Theman
SSC James E. Parkes

DC Test Bed Power Integration Team

8840 Ramone C. LeBron
8840 Angela Oliver
8840 Raymond F. Beach
8840 Robert M. Button
8910 Don Fong
8910 Thomas E. Vasick
8910 Larry Trash
8910 Arthur G. Birchenough
SVER Tom Kaspura
ANLX Gregory Kubat

Exhibit B Dormancy Study for Space Station Freedom PV Module (Addition)

8510 Christopher A. Gallo

Photovoltaic Solar Array Simulators

8910 Thomas E. Vasek
8910 Thomas A. Jett
8910 Arthur G. Birchenough

Modification 32/34 Evaluation Team

0150 Carl F. Weegmann
0150 Vernon F. Hudnut
0150 Timothy D. Best
0150 John A. Andrasik
0150 Robert J. Makovec
3320 Carl L. Silski
3340 Kurt R. Brocone
3340 Laurel J. Stauber
8510 Clinton B. Ensworth III
8530 Mario H. Castro-Cedeno
8610 Luke A. Kirch
8610 L. Rieker Halstead
8620 Byran K. Smith
8620 T. Smith
8620 L. Peecook
8620 Thomas B. Irvine
8620 Mariam C. Felder
8630 Bhim S. Singh
8810 Quyen T. Quach
8810 Rebecca S. Riddlebaugh
8820 Gregory V. Schmitz
8820 Francis M. Haraburda
8820 Sam W. Hussey
8820 Philip A. Stehno
8820 Nancy Rabel
8820 Bradford A. Kaufman
8830 Laura A. Maynard
8840 James E. May
8920 James M. Mullins
8920 Robert D. Crawford
ANLX Leslie Javaras

PDR Resources and Restructuring Team

4120 John M. Bulloch
4130 Noel B. Sargent
4230 Austin L. Evans
4230 Gerald J. Barna
4320 Mei-Hwa Liou
8100 Donna M. Mantenieks
8100 Michael T. Hosler
8100 Rhona Davis-Mensurati
8100 Margaret C. Bollinger
8100 Patricia J. Scheurer
8100 Debra J. DeAngelo
8100 Karen N. Faloon
8100 Joanne M. Flowers
8100 Janice K. Gassaway
8100 James K. Eaton
8100 David M. Elliott
8100 Daniel B. Walker
8100 Robert A. Schneider
8500 Ralph P. Kuivinen
8500 Marton Forkosh
8500 Jeffery S. Hojnicki
8500 Harvey L. Schabes
8500 Frank J. Hrach
8500 David J. Hoffman
8500 Dean W. Bitler
8500 Raymond K. Burns
8500 John W. Dunning
8500 Richard M. Donovan
8500 Gary G. Kelm
8500 Thomas L. Labus
8500 Sina Javidi
8500 Randall C. Speth
8500 Steven D. Johnson
8500 Jose M. Davis
8500 Donald F. Schultz
8500 Jeffrey J. Trudell
8500 Todd T. Peterson
8500 Robert D. Green
8500 David B. McKissock
8600 Richard B. Rogers
8600 Brian F. Smith
8600 James M. Mullins
8600 Bhim S. Singh
8600 Thomas H. Hacha
8600 Suzanne T. Gooder
8600 Jerri S. Ling
8600 Thomas B. Miller
8600 Brian J. Motil
8600 Mark A. Hoberecht
8600 John J. Caruso
8600 Roy L. Pickrell
8600 Luke A. Kirch
8600 Cheryl A. Varney
8600 Sandra T. Reehorst
8600 Stephen N. Simons
8600 Gary W. Wroten
8600 Franklin Vergilii
8600 Terri Smith
8600 Robert W. Hawersaat
8600 Alan White
8600 Daniel C. Briehl
8600 Wayne M. Bartlett
8600 David T. Frate
8600 Nang T. Pham
8600 Richard L. Puthoff
8600 Thomas B. Irvine
8600 Carl W. Richter
8600 Robert D. Corrigan
8600 Daniel J. Gauntner
8600 David F. Chao
8600 Michael C. Hicks
8600 Cosmo R. Baraona
8800 Richard A. Tyo
8800 David W. York
8800 Mark D. Poljak
8800 Karen M. Meinert
8800 Richard A. Edkin
8800 Tesfahunei T. Tecle
8800 Damon M. Shaffer
8800 Quyen T. Quach
8800 Nancy Rabel
8800 Rebecca S. Riddlebaugh
8800 Sam W. Hussey
8800 John D. Taylor
8800 James E. Dockrill
8800 Frederick J. Wolff
8800 James F. Sellers
8800 Sell James, Jr.
8800 Robert C. Seidel
8900 John F. Schubert
8900 Robert D. Draper
8900 Robert D. Crawford
8900 Thomas J. Sours
ADF J. Michael Jamison
ANLX K. Miller
ANLX Richard M. Wilson
ANLX K. Powell
ANLX Paul R. McMasters
ANLX Sherice L. Sampson
ANLX Robert J. Kocsis
ANLX John M. Reece
ANLX S. Quintile
ANLX D. Keith
ANLX P. Shannaham
ANLX R. Cliff
ANLX Alan Richard
CRTZ K. Skufeeda

Concentrator Panel Assembly Test Team

0153 Michael L. Ciancone
4320 Duc Ke Truong
4430 Eric C. Olsen
4430 S. Michelle Everett
7460 Robert L. Hauer
7460 Daniel G. Kocka
8540 Daniel S. Rylicki
8540 Robert D. Corrigan
8540 Linda J. Bartos
8620 Thomas B. Irvine
8620 Carl W. Richter
8910 Dennis M. Thompson
8910 Wilbur D. Knap
8920 Thomas J. Sours
ANLX David B. West
CRTZ Dominic Rinaldi

Optical Test Team for SD Concentrator

7250 Timothy G. Banks
7250 Jack D. Schuerger
8510 Christopher A. Gallo
8510 Robert D. Green
8510 Kent S. Jeffries
8520 Laura K. Greenlee
8520 Todd T. Peterson
8540 Robert D. Corrigan
8910 Wilbur D. Knapp

Low-Speed Axial Compressor Casing Repair

4210 Gerald A. Carek
7440 Daniel A. Jurkovich
7440 Tim Ubienski
7460 William F. Prochazka

Torque Element Repair Team

0300 Chris J. Conrad
0300 Donald R. Striebing

Metallurgy Class Team

7400 Michael W. Sudsina
7400 Karl D. Bergquist

Culture Survey Team

7430 William J. Young
7430 Johnny R. Napier
7440 James D. Wagner
7460 Joseph Duckworth, Jr.

Fabrication Monitoring Team

7410 Eugene P. Miller
7410 Elmer C. Bartels

Arcjet Heat Sink Fabrication Team

7460 Kenneth M. Beno
7460 Richard J. Kajack

Low Speed Axial Large Fiberglass Bellmouth

7450 Herbert G. Stannert
7450 Earl E. Price

Test Section for Pool Boiling Experiment Fabrication Team

7440 Elmer J. Petelka
7440 Patrick Spanos
7440 David P. Pulice

Cascade Airfoil Instrumentation Team

7430 Donald J. Varga
7430 David A. Evanoff
7440 Robert G. Everett

8X6 Calibration Cone Instrumentation Team

7430 David M. Williams
7430 David F. Hamilton

ADP Instrumentation Team

7430 Chip Redding
7430 William J. Young
7430 Dave M. Williams
7430 George J. Saad
7430 David A. Evanoff

Asbestos Abatement Monitoring Team

7350 Christopher L. Rognon
7360 Joanne M. Calla
7360 Lynne R. Montori
7360 Robert W. Stuart
7370 Ernest Bertone II.

Inspection Audit Preparation Team

7420 Daniel W. Buttler
7420 Andrew J. Benek
7420 Henry L. Zimmerman
7420 James Mierzejewski
7420 Jose E. Gonzalez
OMNI Maria I. Flores
OMNI Lynda L. Hambly
CRTZ Robert M. Joyce

ACTS Experiments Development Team

6160 Thomas C. vonDeak
6160 Mark S. Plecity
6160 Robert A. Bauer
8810 Ronald J. Sicker
ANLX Barry J. Fairbanks

Harris Corporation Negotiations

3140 David J. Hale
3140 Jack R. Herman
3340 Joanne R. Poe
6100 Susan M. Crawford
6110 Thomas H. St. Onge
6120 Ernie W. Spisz
6120 David J. Wright
6120 Russell J. Jirberg
6120 Thom A. Coney
ANLX John J. McDermott

ACTS Phase II Flight Safety Team

0153 William R. Schoren
ANLX Lawrence A. Greene
ANLX Robert D. Denington
ANLX Erwin A. Edelman

Computational Simulation of Acoustic Fatigue for Hot Composite Structures

5200 Christos C. Chamis
5210 Pappu L. N. Murthy
SVER Surendra N. Signhal
SVER Vinod K. Nagpal
SVER Edhi Sutjahjo

Mechanical Behavior of Fiber Reinforced SiC/RBSN Ceramic Matrix Composites: Theory and Experiment

0300 Ramakrishna T. Bhatt
5250 John P. Gyekenyesi
CLSU Abhisak Chulya

Tensile Deformation Damage in SiC Reinforced Ti-15V-3CR-3Al-3SN

5220 Bradley A. Lerch
5220 James F. Saltsman

LeRC EOIM-III Flight Experiment

5480 Sharon K. Rutledge
5480 Joyce A. Dever
5480 Kim K. deGroh
5480 Michael J. Mirtich
5480 Bruce A. Banks
SVER Curtis R. Stidham
SVER Thomas J. Stueber
SVER Cynthia M. Katzan
SVER Thomas L. Morton
CSU William Quinn
CSU Ray Olle
CSU Mark Forkapa
CSU Tim McCollum

Brush Seals Team

5300 Robert C. Hendricks
5310 Julie Carlile
5320 Margaret P. Proctor

61/24A, RL Bearings Team

5310 Harold E. Addy
5350 Paul Raitano
SVER James Roncace
SVER Fredrick T. Schuller

MFD Thruster Team

5330 Thomas W. Haag
5330 Maris A. Mantenieks

Continued on page six

June 19, 1992

Lewis Honor Awards Recognize Excellence

The Honor Awards are NASA's highest medals for excellence in science, engineering, service, and leadership. Fifty-three Lewis employees were presented medals during the June 9 ceremony. Richard H. Petersen, associate administrator for Aeronautics and Space Technology, was the guest speaker.

Outstanding Leadership Medal

DePauw

James F. DePauw, chief, Photovoltaic Division, Space Station Freedom Directorate: For superb leadership and exceptional engineering achievements in the development of the Space Station Freedom electrical power system.

Poferl

Dr. David J. Poferl, director of Technical Services: For progressive leadership of a large, diverse directorate that provides outstanding support services to meet the continually evolving research and institutional needs of the Center.

Exceptional Scientific Achievement Medal

James A. DiCarlo, deputy chief, Ceramics Branch, Materials Division: For outstanding scientific and technical leadership of efforts to evaluate, understand, and improve the deformation, fracture, and reliability of high-temperature ceramic fibers and structural composites.

DiCarlo

Nathan S. Jacobson, research engineer, Materials Division: For key contributions toward understanding the environmental durability of ceramic and ceramic matrix composite materials.

Jacobson

Dr. Meng-Sing Liou, senior scientist, Internal Fluid Dynamic Division: For internationally recognized achievements in the development of advanced numerical techniques in computational fluid dynamics.

Liou

Equal Employment Opportunity Medal

Charleston

Jo Ann Charleston, deputy chief, Office of Educational Programs, External Programs Directorate: For outstanding leadership in ensuring that underserved minority youth receive educational opportunities that lead to careers in science and engineering.

Johnson

Susan M. Johnson, aerospace engineer/EEO counselor, Interdisciplinary Technology Office: For outstanding contributions as the lead Equal Employment Opportunity Counselor at Lewis.

Group Achievement Award

Area Safety Committee Chairpersons
Space Shuttle Main Engine Durability Team

40-Year Service Recognition

Gordon Allen, Richard Burley, Robert Collins, Arthur Curren, Americo Forestieri, Robert Friedman, Marvin Hirschberg, Robert Kanney, Andrew Manos, William Ratvaski, Roger Schulte, George Succop, Edward Takacs, Raymond Viancourt, and George Wildschrey

45-And 50-Year Service Recognition

Helen Monroe (45)

W. Charles Noe (50)

Exceptional Engineering Achievement Medal

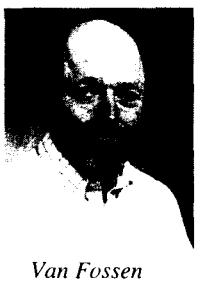
Bruce A. Banks, chief, Electro-Physics Branch, Power Technology Division: For significant contributions to the development of durable materials for space power systems and exceptional leadership in transferring this technology for use in terrestrial applications.

Banks

Noel B. Sargent, electrical engineer, Electronic and Control Systems Division: For improving the safety of aircraft and NASA space flight through exceptional engineering contributions to the field of Electromagnetic Interference/Electromagnetic Compatibility.

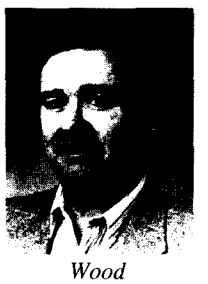
Sargent

Seasholtz



Van Fossen

Vannucci



Wood

Dr. Richard G. Seasholtz, senior research engineer, Instrumentation and Control Technology Division: For pioneering research and development of advanced optical measurement systems for use in aeropropulsion research.

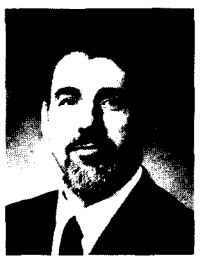
Dr. James Van Fossen, Jr., Internal Fluid Mechanics Division: For combining creative research and outstanding engineering problem-solving skills to overcome key technical challenges in propulsion heat transfer.

Raymond D. Vannucci, senior materials engineer, Polymers Branch, Materials Division: For significant achievements in the development of high-temperature polymer matrix composites.

Jerry R. Wood, deputy chief, Turbomachinery Flow Physics Branch: For internationally recognized engineering achievements in the adaptation of advanced computational fluid dynamics computer codes to the design and analysis of turbomachinery.

Exceptional Achievement Medal

Thomas W. Balogas, electrician, Test Installations Division: For outstanding technical contributions and personal dedication in the design and installation of electrical systems for research facilities.



Balogas

Coy

James R. Coy, research laboratory mechanic, Test Installations Division: For exceptional service in the installation of the Short Take-Off/Vertical Landing (STOVL) model for hot gas ingestion studies in the 9X15 wind tunnel.

William G. Darby, research laboratory mechanic, Test Installations Division: For innovative contributions to the assembly, installation, and modification of the Large-Scale, Low-Speed Centrifugal Compressor.

Henry G. Pfanner, facility manager, Plum Brook Management Office: For significant technical contributions and outstanding leadership of the successful reactivation of three large, unique aerospace test facilities at Lewis Plum Brook Station.

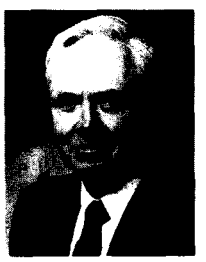
Neil D. Rowe, mechanical engineering technician, Space Experiments Division: For outstanding engineering designs that have contributed significantly to the success of the Space Experiments Program at Lewis.

Darby

Pfanner

Dennis M. Sender, deputy chief, Technical Information Services Division: For outstanding organization and leadership of the many events and programs that commemorated the 50th Anniversary.

Bruce M. Shuman, procurement analyst, Procurement Division: For developing and refining computer systems that have significantly improved the ability of the Procurement Division to quickly generate high-quality solicitations and contracts.



Rowe

Sender

Shuman

Lewis Distinguished Publication Award

Seasholtz

Dr. Richard Seasholtz, Instrumentation and Control Technology Division; **Dr. Steven Schneider**, Space Propulsion Technology Division; and **Frank Zupanc**, Space Propulsion Technology Division, were recently named as recipients of the 1991 Lewis Distinguished Publication Award titled, "Spectrally Resolved Rayleigh Scattering Diagnostic for Hydrogen-Oxygen Rocket Plume Studies." This publication discusses a new method for measuring gas temperature, density, and velocity based on the scattering of laser light from molecules. These measurements are used to verify the accuracy of computer codes used to predict the performance of new rocket designs.

Schneider

Zupanc

Continued on page three

Lewis News Notes

Lewis News

Volume 29 Issue 15 July 17, 1992

STS-46 Focus: High-Tech Material

Exotic high-tech materials that may one day find use on tomorrow's spacecraft will be flying aboard the Space Shuttle *Atlantis* (STS-46), a six-day mission scheduled for late July.

Lewis engineers will be testing 200 different materials designed to withstand the rigors of ultraviolet radiation and the atomic oxygen environment of low-Earth orbit, 300 miles above the Earth.

Dubbed the "Evaluation of Oxygen Interactions With Material (EOIM-III) Experiment," the purpose of the experiment is to enable engineers to make long-range predictions for Space Station *Freedom's* performance and to evaluate materials for use in the SP-100 Program, a developing space nuclear reactor power system.

According to Bruce Banks, chief of the Electro-Physics Branch at Lewis, "Earlier materials experiments we have flown on shuttle missions have shown that many materials degrade substantially in a xreactive atomic oxygen atmosphere. Some materials, in time, actually vanish, while others become brittle, tarnish, or oxidize."

Small samples of materials will be carried in *Atlantis'* cargo bay and exposed to 48 to 72 hours of the space environment. Sample materials include metals, metal oxides, polymers, composites, and even diamond, which are thought to be atomic-oxygen resistant. When the shuttle returns to Earth, the samples will be evaluated and analyzed.

In addition to NASA, the European, Canadian, and Japanese space agencies are participating in EOIM-III, which is managed by Johnson Space Center in Houston, TX.

Engineers are also providing a special protective coating, developed and patented by Lewis. The coating is an integral part of the retrieval system for the European Space Agency's *Eureka* Spacecraft (EUREKA-1), which will be deployed from STS-46 and later retrieved. The EUREKA-1 mission focuses on research in the field of material and life sciences and radiobiology.

Continued on page four

Employees recognized for special achievement

July-September 1992

AST RECOGNITION AWARDS (FRA)

0100 Mulroy, Mary Anne
1130 Cosari, Antoinette
1340 Schwartz, Melva
1510 Horton, Nancy K.
1520 Lisy, Robert P.
1570 Rogers, Jean
1570 Spicer, Thomas
1580 Medzi, Doreen
1580 Pehotsky, Dennis D.
1590 Schultz, Jon C.
2630 Poinsatte, Philip E.
2630 Hippensteele, Steven A.
2710 McDermott, Marie
2740 Carboni, Jeanne D.
2740 Lam, David
2750 Esker, Barbara S.
4110 Espinosa, William D.
4130 Culley, Dennis E.
4330 Petrarca, David A.
5300 Getz, Jody C.
5320 Whalen, Margaret
5320 Zurawski, R. L.
5320 Jankovsky, Robert S.
5350 Zoeckler, Joseph G.
6000 Hack, Kurt J.
6710 Thompson, Robert L.
6820 Dudzinski, Leonard A.
6820 Gefert, Leon P.
6830 George, Jeffrey A.
7440 Wagner, James D.
7440 Kmiecik, Frank L.
7450 Beck, Phillip M.
7610 Krivanek, Thomas M.
7630 Krause, David L.
7650 Egbert, Lloyd G.
7650 Gaffney, James F.
8620 Richter, Carl W.
8810 Kopasakis, George

SPECIAL ACT OR SERVICE AWARDS (SAS)

SAS 0151 Kacmar, Raymond
SAS 2780 Woods, Joann M.
SAS 5100 O'Donnell, Gloria J.
SAS 5120 Gabb, Timothy P.
SAS 5170 Halloran, John T.
SAS 5230 Rohn, Douglas A.
SAS 5430 Kankam, Mark D.
SAS 5430 Baumann, Eric D.
SAS 5480 Banks, Bruce A.
SAS 6400 Doherty, Michael P.
SAS 6400 Peecook, Keith M.
SAS 6400 Pischel, Marisa
SAS 6510 Stakolich, Edward G.
SAS 6510 Wikete, Joseph E.
SAS 6710 Thompson, Robert L.
SAS 6720 Jacobson, Thomas P.
SAS 6720 Pline, Alexander D.
SAS 6720 Lauver, Richard W.
SAS 6780 Wald, Larry W.
SAS 6780 Szaniszlo, Andrew J.
SAS 6800 Lewis, Patricia A.
SAS 6810 Carney, Michael J.
SAS 6820 Meyer, Shari L.
SAS 6840 Cataldo, Robert L.
SAS 6850 Black, Stephanie J.
SAS 7200 Robinson, Nazzetta W.
SAS 7202 Wolfe, Alan R.
SAS 7230 Cmarik, Thomas
SAS 7230 Bevacqua, Philip A.
SAS 7230 Sobolewski, Ronald J.
SAS 7230 Wisniewski, Joseph S.
SAS 7230 Flaisig, Richard M.
SAS 7230 Fallert, Ralph
SAS 7230 Ropchock, John J.
SAS 7230 Nealen, Donald R.
SAS 7230 Arida, Wade T.
SAS 7230 Zaldana, Antonio R.
SAS 7230 Brusk, Kevin D.
SAS 7240 Schuerger, Jack D.
SAS 7240 Hill, Jerry W.
SAS 7250 Lilly, David R.
SAS 7250 Green, Eli
SAS 7250 Stephenson, Barry
SAS 7250 Ollick, Carl A.
SAS 7250 Schroeder, Clifford H.
SAS 7260 Frimel, Ronald C.
SAS 7260 Pennington, Charles D.
SAS 7260 Maschak, Louis
SAS 7280 Naugle, Clifford R.
SAS 7280 Nickel, James R.
SAS 7280 Rivera, Ricky N.
SAS 7290 Geil, Robert F.
SAS 7290 Chapek, Richard M.
SAS 8500 Brickner, Sandra A.

SUSTAINED SUPERIOR PERFORMANCE AWARDS (SSP)

SSP 0130 Adamczyk, John J.
SSP 2703 Bailey, M. Murray
SSP 2740 Wong, Kin
SSP 2740 Hammer, Darcie

(continued on page 6)

Lewis technology improves sunglass lens quality

(continued from page 3)
marketed under the name Diamond-Hard, have scratch-resistant lenses that are coated by a process derived from Lewis technology.

Current Lewis efforts have focused on developing improved transparency DLC films using dual beam deposition processes. If extremely clear and hard coatings can be deposited, Diamonex, Inc. would utilize the process to produce protective and anti-reflective coatings for prescription eyeglass lenses.

"The fact that Lewis DLC technology is now being used to produce a commercial product is a tribute to the unwavering commitment of people such as Mike Mirtich and the support of Mike Kussmaul," noted Bruce Banks, chief of the Electro-Physics Branch. ◆

February 11, 1994 Lewis NEWS

Team recognized in Hubble telescope repair effort

TWO weeks after the December 1993 servicing mission that corrected the Hubble Space Telescope's mechanical and electronic problems, a team of Lewis employees were recognized for their contribution to this successful mission.

In December 1992, Goddard and the European Space Agency (ESA) approached Lewis' Electro-Physics Branch for help in the evaluation of various telescope's vibration prone solar panels.

The team was challenged with the task of evaluating various protective coatings as well as unprotected surfaces to be used in the repair of the telescope.

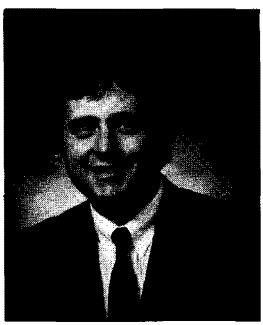
The team comprised of Kim de Groh, Joyce Dever, Sharon Rutledge, Curtis Stidham (Sverdrup), and Thomas Stueber (Sverdrup), received a Group Achievement Award for their evaluation of various thermal shield materials that proved to be a crucial element in the repair of the thermal shield materials to be used on the telescope. Confidently accepting this task, Bruce Banks, chief of the Electro-Physics Branch, brought together five branch employees with expertise in thermal shield materials. Working under an intense six-month schedule, the Hubble Space Telescope Thermal Shield Durability Evaluation Team was challenged with the task of evaluating various protective coatings as well as unprotected surfaces for use with the solar array bistem to be installed on the telescope during the December servicing mission.

(continued on page 4)

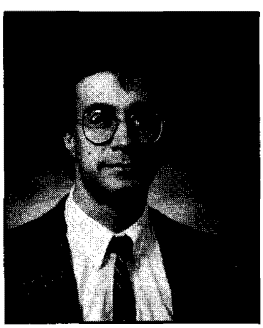
de Groh

Dever

Rutledge



Stidham



Stueber

Lewis contributes to success of Hubble repair mission

(continued from page 3)

Extremely careful sample handling and environmental simulation control was necessary to properly evaluate the low Earth orbital durability of the candidate thermal shield materials. According to Banks, the evaluation required a special fixturing to be designed and installed in the Electro-Physics Branch steady-state vacuum ultraviolet (VUV) and atomic oxygen/VUV exposure facilities.

The team included personnel from the TID, Photo Lab, and Cleveland State University.

"The team lead by Joyce Dever, in collaboration with personnel from the Test Installations Division, the Photo Lab, and Cleveland State University, was successful as a result of their diligent efforts, often working well beyond the normal working hours," Banks commented.

As a direct result of the team's intensive efforts, coating failures were observed, which had not been seen by the European Space Agency or Goddard, that would have caused significant risk to the performance of the Hubble Space Telescope after installation of the thermal shields. At the conclusion of the evaluation, an uncoated thermal shield proved to be the most reliable and durable and was adopted for the Hubble Space Telescope servicing mission.

"The team demonstrated a high level of teamwork with outstanding efforts to provide the customer with the information they needed in a timely and responsible manner," Banks explained. "The team also interacted successfully with the customer, developing a relationship that brought a high level of respect for the caliber and commitment of Lewis personnel." ◆

Educational outreach encourages tomorrow's engineers

(continued from page 3)
engineers who volunteered to visit schools.

"The number of local schools visited, as well as the number of participating Lewis engineers, has grown significantly in the past two years," said Nyerges. "In 1991, we visited 8 schools; in 1992, 97; in 1993, 107; in 1994, more than 130, at all levels from elementary to high school."

In January, Nyerges and Budd sponsor on-site workshops tailored toward NEW classroom speakers. The workshops introduce speakers to the array of educational material available from the national NEW as well as local NASA Lewis resources, and finalize logistics in assigned schools.

A banquet culminates the week-long celebration and brings together Cleveland area engineers and their families, students, and educational personnel for an awards program honoring winners of the NEW events (e.g., college egg drop contest), as well as outstanding engineers of the year in several categories. Lewis was recognized for its NEW contributions.

Ken Bowersox, astronaut and shuttle pilot for STS-61, the December '93 mission that repaired the Hubble Space Telescope, served as this year's banquet speaker.

"We believe the contributions and presence of Lewis in this community and educational event have bolstered the activity's growing popularity in the Cleveland area," said Nyerges. "Continued development of Lewis involvement is expected in coming years as it is an important educational and professional outreach program that also demonstrates the Lewis mission and story."

Added Budd, "We're grateful for the outstanding support of this effort by our Lewis engineering and science classroom speakers. They provide the personal 'spark' of interest." ◆

Photo by Quentin Schwinn

Sharon Rutledge and Bruce Banks, Electro-Physics Branch, combine their scientific knowledge and creativity to demonstrate the skins' ability to sense the difference between visible and infared radiation. The Lewis team traveled to Greenbriar Middle School during National Engineers Week. "We've found that demonstrations rather than straight lectures gain students' attention and opens their eyes to science and math."

Lewis develops technique for state-of-the-art restorations

By Kristin K. Wilson

LEWIS, in concert with the Cleveland Museum of Art, has developed a varnish (lacquer) removal technique that will enable museums and art collectors to more safely restore paintings. This non-contact method is less harsh than traditional methods, which not only remove varnish but often remove paint pigments and cause paint to swell.

Lewis' Technology Utilization Office began investigating varnish removal techniques after discussing conservation needs with the Cleveland Museum of Art. Over the years the museum's conservation department encountered numerous varnishes that could not be safely removed using traditional solvents and was eager to investigate new alternatives.

"Most artists before the Impressionists intentionally varnished their paintings to protect them and make the colors appear richer," explained Cleveland Museum of Art's Chief Conservator Bruce Christman. "As varnish ages it tends to yellow, causing the painting to lose its perception of depth. Restoration typically involves removing the varnish with organic solvents, which may cause swelling or leaching of the paint layers. We began working with Lewis to develop a new method of restoration to use on varnishes that cannot be removed using conventional methods."

A Lewis team experimented with a thermal energy atomic oxygen plasma, originally developed to simulate the space environment in low Earth orbit, and discovered that it easily removed organic materials from paint and painted canvas samples.

"The oxygen atoms and ions in the thermal energy plasma chemically react with the surface and remove any organic material present," explained Sharon Rutledge, Electro-Physics Branch. "Atomic oxygen will not react with oxides, so most paint pigments won't be affected by the reaction." For paintings containing organic pigments, the exposure can be carefully timed to stop the removal short of the pigment.

According to Rutledge, tests of the atomic oxygen method on a painted canvas test sample and color samples from the museum show great promise. "The lacquer was easily removed from all the samples and no noticeable change in appearance was observed after the fresh lacquer was applied," she said. "Most importantly, there was no removal or disturbance of the paint pigment on the surface."

The atomic oxygen varnish removal technique is less harsh than traditional methods, which not only remove varnish but often remove paint pigments and cause paint to swell.

With the development of the atomic oxygen technique, Lewis is discussing collaborative activities with the conservation department at New York University's Institute of Fine Arts to restore a Monet painting damaged in a fire in the 1950s. Lewis is also pursuing partnerships with the Smithsonian Institute Analytical Laboratory and Buffalo State College's Conservation Department to restore other paintings damaged by smoke and fire.

"This is another good example of how technology developed for space applications can have great potential for applications in areas that are often seemingly unrelated to aerospace technology," commented Bruce Banks, chief of the Electro-Physics Branch. "Such unique applications serve as a reminder to us that we should always keep our eyes open to diverse opportunities for utilizing technology, which may on the surface appear only relevant to space applications."

Portions of this article were written by Maria Thomas, GLITeC. ◆

Recognizing outstanding achievement

Lewis employees receive 1996 Honor Awards

ON June 12, Center Director Donald Campell and NASA Acting Deputy Administrator General John Dailey presented plaques and medals to 275 Lewis employees for their outstanding contributions.

Forty-Year Service Awards

Presented to *Charles A. Barrett*, Environmental Durability Branch; *Charles W. Slauter*, Fabrication Support Division; *Victor G. Weizer*, Photovoltaic Branch; and *Harold D. Wharton*, Office of the Comptroller.

Distinguished Publication Award

Presented to *G. James Van Fossen, Jr., Robert J. Simoneau, and Chan Y. Ching* in recognition of the excellence and value of their publication titled, "Influence of Turbulence Parameters, Reynolds Number, and Body Shape on Stagnation-Region Heat Transfer."

Abe Silverstein Medal for Outstanding Research Leading to Practical Applications

Presented to *David J. Larkin* for his contribution and leadership in crystal growth for NASA Lewis' high temperature electronics and integrated sensors program.

Steven V. Szabo Award for Engineering Excellence

Presented to *John P. Gyekenyesi, Lesley A. Janosik, Noel N. Nemeth, and Lynn M. Powers* for exceptional engineering achievement that provides an innovative and cost-effective approach to brittle material component design and optimization.

Presented to *William O. Hughes, Evert B. Hurst, and Anne M. McNelis* for exceptional engineering achievement in the design, testing, and implementation of an improved acoustic treatment for the Titan IV/Cassini mission that eliminated the need for a costly requalification of the Cassini spacecraft's power source.

Presidential Rank Awards

Meritorious Executive—Presented to *Gerald J. Barna* and *Donald J. Campbell* for sustained superior accomplishment in management of programs of the United States Government, and for noteworthy achievement of quality and efficiency in the public service.

Exceptional Achievement Medal

Presented to *Michael J. Blotzer* for excellence in management of industrial hygiene and health physics functions at NASA Lewis.

Presented to *Robert M. Brej* for exceptional accomplishments in support of the Advanced Communications Technology Satellite (ACTS) and the Telemedicine Space Bridge projects.

Presented to *Thomas O. Cressman* for exceptional engineering and leadership in the successful completion of two missions for the Spread Across Liquids Sounding Rocket Combustion Experiment.

Presented to *Walter S. Kim* for outstanding leadership of NASA Lewis' Small Business Innovative Research Program and in the area of technology transfer and commercialization.

Presented to *Anita D. Liang* for outstanding contributions and dedicated leadership in planning, guiding, and directing the Earth-to-Orbit Technology Program at NASA Lewis.

Presented to *George C. Madzsar* for exceptional engineering contributions to the field of self-diagnosing sensors.

Presented to *Terrian V. Nowden* for exceptional achievement in the fabrication and development of instrument research components.

Presented to *Wayne A. Whyte, Jr.* for exceptional contributions to NASA's Commercial Communications Program and the satellite industry it supports.

Presented to *Edward A. Winsa* for exceptional achievement resulting from outstanding leadership in the development and implementation of the Isothermal Dendritic Growth Experiment.

Exceptional Service Medal

Presented to *Sandra A. App* for providing exceptional initiative and administrative service to the Aeronautics Directorate and the Center.

Presented to *Bruce A. Banks* for exceptional engineering contributions in the transfer of NASA technology to U.S. consumer-product and biomedical industries.

Presented to *Richard T. Barrett* for unique and outstanding contributions to the understanding, compilation, and dissemination of expert criteria on the selection and use of fasteners.

Presented to *James C. DeRaimo* for outstanding engineering contributions and leadership in establishing and sustaining a proactive Pressure Vessel Recertification Program for all pressurized systems at NASA Lewis.

Presented to *Linda D. Dukes-Campbell* for exceptional service in expanding public awareness of NASA Lewis programs and activities, ensuring a NASA Lewis presence in appropriate community events.

Presented to *Susan F. Gott* for exceptional performance of secretarial and administrative skills, which have significantly contributed to the efficiency and effectiveness of the Engineering Directorate.

Presented to *Kenneth W. Guinta* for consistently outstanding efforts in the design, fabrication, and development of research related hardware.

Presented to *Virginia T. Indovina* for outstanding performance of Secretarial/Administrative duties associated with the Chief Scientist's Office and notable contributions to the Senior Secretarial Staff activities.

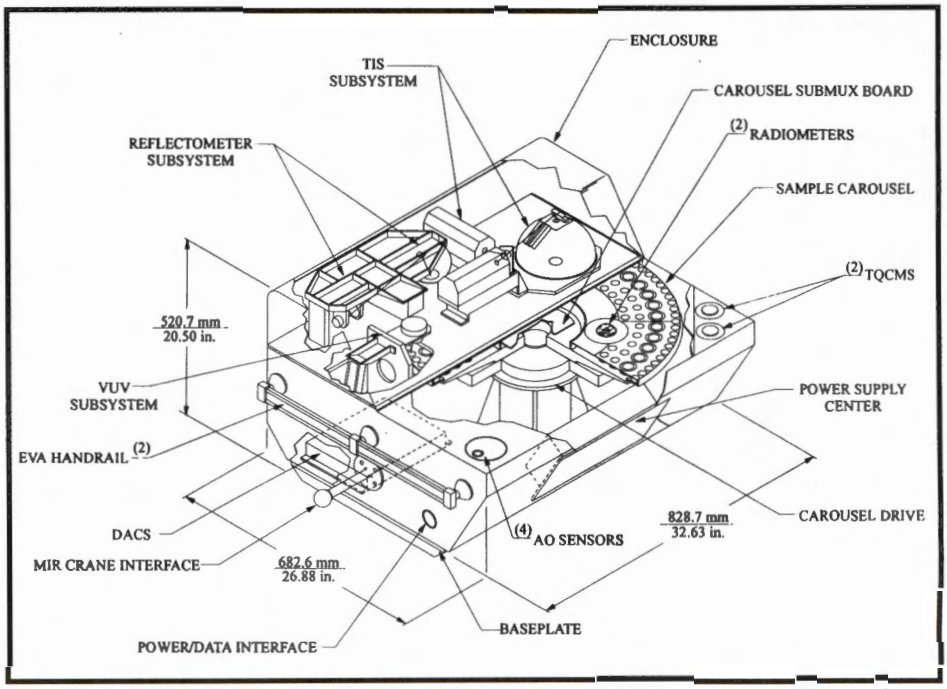
Mir *environment examined*

Unique experiment measures material contamination

By S. Jenise Veris

MEMBERS of NASA Lewis' Electro-Physics Branch recently applied their expertise to a groundbreaking experiment now onboard the Russian Space Station *Mir*, called the Optical Properties Monitor (OPM). An active experiment the size of a suitcase, OPM will provide a unique, comprehensive space research capability to study the effects of the space environment—both natural and induced—on optical, thermal, and other properties of spacecraft materials.

"We wanted to participate because it was an ideal opportunity to fly various materials and observe their performance —an endeavor that normally would be cost prohibitive," said Bruce Banks, chief of the Electro-Physics Branch. "Not only do we have the opportunity to test those items, but we also get a snapshot of what types of contaminants exist in the *Mir* environment."



The carousel assembly of the Optical Properties Monitor experiment rotates flight samples into proper position to enable measurement by various instruments.

OPM launched onboard Space Shuttle *Atlantis* in January and was mounted outside the *Mir* docking module where it will collect data about the space station's environment for one year. The results of the data are predicted to impact all future long-term spacecraft and particularly the development and operation of the International Space Station (ISS).

The OPM flight experiment was developed by AZ Technology, Inc., Huntsville, AL, under the Office of Aeronautics and Space Technology In-Space Technology Experiment Program and the ISS Phase I Risk Mitigation Experiment Program.

Banks was invited to serve as a member of the advisory committee to assess samples for OPM, at the request of OPM Principal Investigator Don Wilkes of AZ Technology, Inc. The committee received a total of 228 sample proposals from 17 U.S. organizations and two foreign ISS partners, all vying for the 110 sample slots contained on OPM. Six of those slots were awarded to NASA Lewis' Electro-Physics Branch. Don Jaworske coordinated the effort of assembling samples submitted by the branch.

All 110 samples are arranged on half of a carousel in four concentric rows. The carousel moves the samples under instruments that measure various properties once a day. The third row of samples, where the majority of NASA Lewis samples are located, is measured by the Total Integrated Scatter (TIS) instrument. In this instrument, light from a laser beam is scattered by surface irregularities. This provides a charting of surface quality over a period of time to determine rate of degradation of materials in the *Mir* environment.

Contamination is an issue of general concern that can affect the performance of power systems on spacecraft. The most common contaminants in the space environment are silicones and hydrocarbons. In low Earth orbit, silicon is oxidized and forms glass-like deposits, which become discolored. These deposits often cover the surface of various materials and absorb light, causing spacecraft to become hotter.

A sample of an aluminum coated surface mirror, submitted by Kim de Groh, will provide insight into how contaminants affect the reflectance of a mirrored surface. This information will be valuable in understanding the efficiency of solar dynamic concentrators.

Sharon Rutledge has two samples on OPM: an ISS solar array blanket fact sheet and a purposely defective thin film of aluminum on Kapton H. Kapton H is an amber-colored, high temperature polymer used in the manufacture of solar array blankets and requires an atomic oxygen protective coating. Once the protective coating on Kapton becomes compromised, the underlying Kapton can fall prey to atomic oxygen that erodes the Kapton and causes undercutting.

Levelized aluminum is being considered as the reflector for solar dynamic concentrators. Jaworkse prepared the first surface aluminum-coated, levelized mirror sample for exposure and concurrent TIS measurement on OPM. The sample will be used to measure the extent and rate of the undercutting phenomena on an as-manufactured sample, and the information gained will be important in determining the performance and lifetime of solar dynamic concentrators in low Earth orbit.

The OPM will also provide in-space, time-dependent flight data for a Monte Carlo computational module developed by Banks. "The data will fine tune predictions on a pattern of behavior for material exposed to the space environment," Banks explained.

OPM will provide information useful in designing an environmentally durable ISS. ◆

Photo by Chris Lynch

Celebrating women throughout history

The NASA Lewis Women's Advisory Group sponsored the return of the Women In History Troupe to celebrate Women's History Month and the 150th anniversary of the Women's Rights Movement. Actors Charlene Connor and Sherrie Tolliver performed poignent vignettes of the lives of Susan B. Anthony, a leader in the women's suffrage movement, and Bessie Coleman, the first American of any race or gender to earn an international pilot's license, respectively. The presentations served as timely reminders of the risks and sacrifices endured by women throughout history that opened new and well-deserved opportunities for women of this generation. Following the vignettes, the Women's Advisory Group presented 1998 Federal Women's Program awards to Bruce Banks, chief of the Electrophysics Branch, and June Szucs, Community and Media Relations Office, in recognition of their contributions to the advancement of women at NASA Lewis.

Banks

Szucs

(Left) *Sherrie Tolliver of the Women in History Troupe recreated the heroics of Bessie Coleman, the first African American woman to earn a pilot's license.*

Lewis Technology Transfer

A boost for the biomedical industry

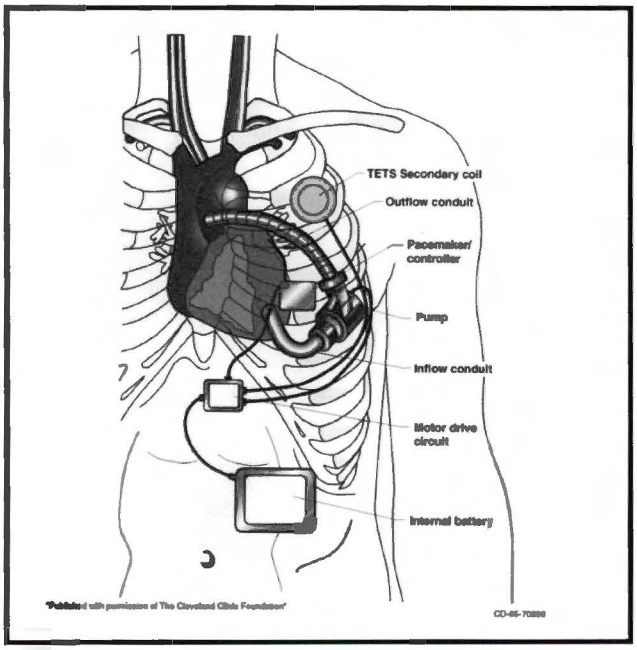
By S. Jenise Veris

The following article is part one of two articles addressing NASA Lewis' opportunities for partnerships in the emerging biomedical technology industry.

NASA Lewis is poised to provide the tools for biomedical innovation in what the Northeast Ohio Regional Economic Development Strategies Initiatives identified as an emerging industry that will be key to the future growth and prosperity of the Cleveland/Akron Metropolitan Area.

The initiative is supported through the partnership of the Akron Regional Development Board, Cleveland Tomorrow, and the Greater Cleveland Growth Association to identify the dominant industries driving the regional economy and to create strategies to position Northeast Ohio for future economic prosperity.

"The successful use of space technology to boost biomedical innovation is why NASA Lewis has become involved in several long-term collaborations with local medical and research institutions including the Cleveland Clinic Foundation, Case Western Reserve University and Cleveland State University," said Larry Viterna, chief of Lewis' Commercial Technology Office. "In fact, the latest issue of *Popular Science* magazine's focus on the Top Ten greatest medical inventions of the millennium is indicative of the interest stirring in this area."



Working in collaboration with the Cleveland Clinic, NASA Lewis applied its turbomachinery expertise in the design of the Innovative Ventricular Assist System Heart Pump.

Convincing local developers to create buildings with lab space and high-tech capabilities for fledgling biotech companies was until recently a major stumbling block to developing such partnerships. The success of Gliatech, a 10-year old biomedical firm; the opening of a joint Cleveland State University (CSU) Cleveland Clinic Foundation (CCF) Mass Spectrometry Facility; and the construction of a new CCF microelectronicalmechanical systems (MEMS) laboratory provides evidence of growth in the biomedical market and a reason for developers to begin hatching plans of their own.

Competitive industries that have close buy-sell relationships, utilize common technologies, and/or share a labor pool, are partnering to achieve a competitive advantage in this growing market.

Dr. Fred Cornhill, chairman of the Clinic's biomedical engineering department, said that Northeast Ohio holds the potential to become a leading biomedical MEMS capitol because of its solid base of medical institutions, its manufacturing capabilities, and the prominent MEMS research program at Case Western Reserve University.

With more than 1,200 biomedical experts attending the annual meeting for Cleveland's Biomedical Engineering Society last fall came enthusiasm and inquiry about the region's biomedical research and education.

EXPLORING THE POSSIBILITIES

NASA Lewis' Commercial Technology Office (CTO) is exploring new approaches for partnering and expanding the application of Lewis technologies in the field of biomedical research and new product development. The CTO recently partnered with the Great Lakes Industrial Technology Center (GLITeC) to host a workshop to bring together Cleveland area biomedical companies and Lewis researchers from selected technology areas to identify new product development ideas/needs and potential partnerships.

"Our strategy is to engage the regional biomedical community through a variety of forums and networking opportunities and to leverage our efforts by working with organizations such as the Edison Biotechnology Center and the Greater Cleveland Growth Association," said CTO's Matt Moran. "By tapping into the existing biomedical infrastructure we can better understand the needs of this industry sector and identify Lewis technologies that can satisfy those needs."

Considered a prime source for much of the nation's new technology since its inception, NASA has and continues to be a valuable resource for many start-up efforts including biomedical technology through its technology transfer and commercialization efforts. Indeed, NASA Lewis has an impressive portfolio of biomedical technology applied to innovative medical products, devices, and methods to better diagnose and treat illnesses.

FROM PROPULSION TO PROSTHETICS

A NASA Lewis Ion Beam Applications Research Program established in 1975 led to a number of nonpropulsive

biomedical applications of ion thruster technology. The same ion thruster technology that is propelling Deep Space 1 is used for ion beam interaction with materials for sputter etching, deposition, and texturing.

Bruce Banks, chief of Electro-Physics Branch, and Sharon Rutledge, a senior member of his staff, have patented a number of exciting biomedical innovations using the technology to resolve problems associated with soft tissue and bone implants, an area that still presents a major challenge among researchers.

Notable among their efforts is the technology patented and used to identify surface textures suitable for improved tissue response in breast prosthesis which was developed in collaboration with Case Western Reserve University Department of Biomedical Engineering and transferred in the local start-up of Applied Medical Technologies, Inc. The same ion beam sputtering technology was applied in a patent to etch tiny holes in material for a hydrocephalus shunt, which makes possible a direct route for drainage of cerebral spinal fluid to replicate the normal flow process without the need for a valve.

"Over the past 18 years we have been particularly successful in the process of texturing materials using a variety of space spin-off technologies," Banks said. "More recently we have applied atomic oxygen technology, which can be damaging to materials in space but has a number of useful applications on Earth."

"By tapping into the existing biomedical infrastructure we can better understand the needs of this industry sector and identify Lewis technologies that can satisfy those needs."

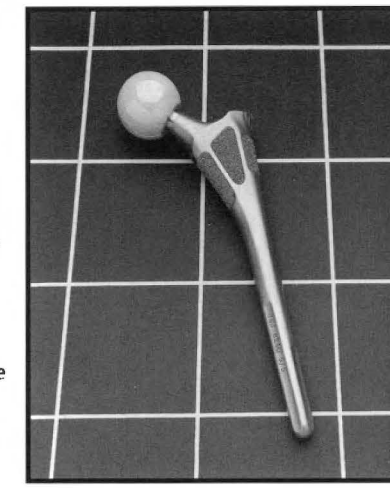
—Matt Moran, NASA Lewis

A Centerwide Bioengineering Initiative begun in 1994 to identify NASA Lewis technologies with potential biomedical in the Greater Cleveland community laid a foundation for current biomedical outreach efforts. Bioengineering projects identified in such areas as fluids, materials, communications and electronics, and computer modeling have met with great success.

NASA Lewis' CARES software program enables industries to understand the strengths and weaknesses of brittle materials with a wide range of applications including ceramic hip joints and dental crowns. It was the Software of the Year winner in 1994 and co-recipient of a 1995 *R&D 100* award as one of the top 100 developments.

PARTNERING FOR THE BENEFIT OF ALL

The joint development of a texture technique for titanium biomedical implants; an artificial heart pump; and computer-assisted minimally invasive surgery is a result of a NASA



NASA Lewis' CARES software can be applied to predict the durability and strength of various materials such as the cereamics used in the ball joint of the hip prosthesis pictured right.

Lewis and CCF Space Act Agreement signed in 1997. Turbomachinery technology, the area for which Lewis is now designated lead for the entire Agency, played a key role in the successful design of the Innovative Ventricular Assist System Heart Pump.

NASA sponsored research in the areas of protein crystal growth, three-dimensional tissue culturing, and noninvasive diagnostic technology is making possible improved treatments for diabetes through a Space Act Agreement between NASA's Office of Life and Microgravity Sciences and Applications and the Juvenile Diabetes Foundation.

An example of noninvasive diagnostic technology that was transferred through the partnership is a portable laser light-scattering instrument applied from technology originally developed by NASA Lewis' Dr. Rafat Ansari to conduct fluid physics experiments on board the space shuttle. Used during regularly scheduled examinations, the device can help with the early detection of diabetes-related optical problems like retinopathy or retina disease, the leading cause of adult blindness in North America.

The Edison BioTechnology Center, Inc., a subsidary of the Batelle Memorial Institute, is bringing information about these and other biomedical technologies to the public through its monthly breakfast series programming. On Mar. 16 Moran will participate in a panel discussion titled "Technology Development Through Federal Partnerships: Tips From Successful Grantees."

A in-depth look at creative partnering for product development and investigation of potential biomedical applications for such technologies as microgravity processing, structural analysis, satellite networks & architectures, MEMS, polymers, embedded web, electrophysics, digital image processing, and semiconductors will be the focus of the next article. ◆

SPACE-AGE MEDICINE

This is part two of a series of articles about NASA Glenn's role in fostering the development of biomedical products with local companies and research institutions to help strengthen a growing business cluster considered key to the future economy of Northeast Ohio.

BY S. JENISE VERIS

A laser light-scattering probe that removes cataracts, an artificial heart-pump, orthopedic and soft-tissue implants, and computer-assisted surgery—all things once considered improbable—now are possible as a result of space technology advances and the skill of NASA Glenn scientists and engineers.

While biomedical/biotechnology is not directly a part of NASA Glenn's mission, technology transfer is a major mission for the entire Agency. Therefore, biomedical spinoffs from NASA Glenn technology advances are not only strongly encouraged but also have become quite prevalent.

"It's important to remember that small businesses are responsible for a significant amount of the commercialization in the biomedical arena," said Walter Kim, NASA Glenn's Small Business Innovation Research (SBIR) program manager. "They may be directly funded by a NASA SBIR, the Ohio Department of Development, or receive some other state or Federal assistance. The novelty of a SBIR, however, is that it is a low risk way to develop innovative products and processes that can then be commercially marketed," he added.

Photo courtesy of the Electro-Physics Branch

Sharon Rutledge and Bruce Banks, both of the Electro-Physics Branch, discuss texturing techniques for a biomedical implant.

Al Ware, Inc. of Cleveland enjoyed tremendous success with the assistance of a NASA Glenn SBIR. The company developed a computer program that uses artificial intelligence technology developed by NASA Glenn to enhance experimental designs in the scientific and research communities. Originally developed for the Center's Structural Analysis program, the technology is now used by a diverse customer base in the area of composites, pharmaceuticals, and medicine that includes Eli Lilly and Company, S. C. Johnson Wax, B. F. Goodrich, Dow Chemical, and The Glidden Paint Company.

Two NASA Glenn biomedical proposals for possible SBIR funding have been accepted under the subtopic of microgravity research since none exist specifically for biomedicine. However, these contracts and NASA's recent award of $33 million in grants to 48 researchers across the country to conduct microgravity biotechnology research may be the sign of an evolution in biomedical/biotechnology development.

"NASA is charged with transferring its technology to the public for the improvement of life on Earth. Our visionary researchers, scientists, entrepreneurs, and clinicians have made giant leaps in technology application. Who would have dreamed that we could map human tissue by mapping the distant stars," NASA Administrator Daniel Goldin said in his message on NASA's role in women's health.

According to Bruce Banks, chief of NASA Glenn's Electro-Physics Branch, his group represents less than 1 percent at the lab, but is responsible for 70 percent of the tech transfer conducted through the Great Lakes Industrial Technology Center (GLITeC), NASA's Regional Technology Transfer Center operated by Batelle, Inc. About one-eighth of their effort is devoted to biomedical research. Banks and Sharon Rutledge have been the researchers and technical consultants for many biomedical spinoffs such as hydrocephalus shunts, soft-tissue implants, and more recently, percutaneous connectors that penetrate the skin without causing bleeding or infection.

"It's a small fraction of the request for our assistance with the greatest potential for good," Banks said. "Some things we do for space—maybe it will fly or maybe not—but with the spinoffs that are successful there's a bigger chance that it will get used and a greater chance that it will touch every American instead of a select few." "It makes you feel good to know you improved the quality of life for somebody," Rutledge added.

Sandra Reehorst, a senior executive service candidate, recently completed one of three program assignments at the Cleveland Clinic Foundation (CCF). One of her goals was to establish a better partnership between the

Agency and the biomedical industry, in general, and specifically between NASA Glenn and the CCF. She also provided managerial assistance at the request of the newly formed Medical Device Innovation Group of the Department of Biomedical Engineering at the Clinic.

During her assignment she discovered that more than $1 billion is spent annually on medical research between the three major medical research institutions in Cleveland—CCF, University Hospitals, and MetroHealth Systems.

"NASA and biomedical research institutions are providing cutting edge technologies that frequently cross paths," Reehorst said. "As NASA Glenn assists biomedical development, our aerospace development efforts could benefit financially from additional leveraged funding; technically from having our staff making additional scientific contributions and politically as an example of outreach and partnering with our neighbors in the private sector."

Reehorst teamed with Matthew Moran, Commercial Technology Office (CTO) biomedical project manager, and GLITeC's David Salay, Alyssa Frank, and Bonita Frank to host an Ideation Workshop that brought together representatives of leading biomedical companies and NASA Glenn technologists to identify new product development ideas and areas with the greatest potential for partnership. Attendees said they found the sessions relevant and would like to be a part of future workshops.

"I was looking for a partner to pursue an alternative approach for treating nystagmus, an involuntary movement of the eyeball, or an alternate treatment for cystic fibrosis using MEMS [microelectromechanical systems] technology," said Thomas Glasgow, a technical consultant in the Materials Division. "The applications for MEMS technology are so vast that it could be attached to a lens to direct eye movement, or fitted in a special vest combined with computer intervention to simulate the therapy necessary for cystic fibrosis patients without the pain."

Joseph Ponyik, a member of the NASA Glenn team that created Tempest—the Agency's 1998 Software of the Year—promoted the Embedded Web Technology program as an enabling technology for telemedicine applications using the Internet to eliminate the need for specialized equipment.

NASA Glenn is a part of a concerted and well-coordinated effort to attract and provide resources for this and other new technologies in Ohio. Based on its funding, knowledge and physical technologies, facilities, and business incubator, NASA Glenn is poised to be a major player in Northeast Ohio.

The most frequently used mechanisms to establish partnerships with industry, foundations, universities, and other non-government organizations are Space Act Agreements (SAA). They are designed to help put technology in the hands of companies through full or partial reimbursable and non-reimbursable contracts.

An SAA recently signed between NASA Glenn and Micro Medical Devices provides technical assistance from Mary Vickerman and the Computer Services Division's visualization team. They are helping the company to apply software used for the Hubble Space Telescope to improve image quality of a fiber optic instrument to perform minimally invasive surgery. Another SAA nearing approval partners NASA Glenn's Mario Castro and Case Western Reserve University's Dr. Russell Wang to develop a low melting point titanium alloy that could replace gold and other materials for dental work such as fillings, crowns, and implants.

GLITeC enhances NASA Glenn's profile by bringing together a network of experts under an umbrella SAA that allows quick turnaround in the negotiation of short-term technical assistance, long-term collaboration, or partnerships with companies throughout the six-state Great Lakes region.

This relationship with GLITeC, combined with Enterprise Development, Inc.'s expertise in client management, makes the Lewis Incubator for Technology (LIFT), a Glenn-funded incubator, an important link to launching a number of biomedical ventures. LIFT also plans to open a software, electronics, and communications incubator next month.

Educating NASA Glenn engineers to respond to the future needs of the biomedical industry is the next step in creating new businesses for a stronger biomedical cluster. NASA Glenn Director Donald Campbell and CTO Chief Dr. Larry Viterna recently accepted an invitation to be a part of a steering committee to establish a joint-Doctoral Degree Program between Cleveland State University and the Biomedical Engineering Department at the Cleveland Clinic.

"The program would afford a number of NASA Glenn employees the opportunity to train with Clinic doctors in an cooperative agreement at Cleveland State University free of charge, which would then put biomedically-trained researchers within NASA to further facilitate biotechnology transfer," Viterna said.

In the meantime, CTO's Moran is working with the Cleveland Clinic to build on the success of Reehorst's tour of duty through a continual exchange of knowledge.

Reehorst said this is a positive step in building a strong partnership with the Clinic and is an avenue that should be investigated with other members of the Northeast Ohio biomedical cluster. ◆

Photos courtesy of GLITeC

NASA Glenn's Dr. Walter Merrill (top), interim director of the Glennan Microsystems Initiative, addresses biomedical industry executives at the Ideation Workshop held at NASA Glenn last August.

THE MEDICAL DEVICE MARKET IS BIG BUSINESS, WITH SALES REACHING APPROXIMATELY $150 BILLION WORLDWIDE IN 1998.

Source: Battelle, Inc.

Glenn tests material to secure Hubble blankets

GLENN researchers have added their knowledge and experience of space-exposed materials to provide a more durable insulating skin for the Hubble Space Telescope.

The last two of the four space walks as part of the STS-103 mission, astronauts planned to repair the telescope's multi-layer insulation (MLI) blankets. With launch delays, the last space walk has been postponed for the next servicing mission. The MLI blankets, which are made up of 17 thin layers of metallized plastic, protect equipment from temperature extremes as the telescope moves into and out of Earth's shadow.

Samples of the blankets brought back after the two Hubble servicing missions (1993/1997) were cracked and brittle. Shortly after, Glenn researchers, Kim de Groh, Joyce Dever, and Bruce Banks, Electro-Physics Branch, became part of the Goddard Space Flight Center-led Hubble MLI review board. The board worked to help determine the damage mechanism and identify a replacement material.

"Ironically, our team chose the same material as before but modified it with a scrim, or fabric, bonded to the backside," de Groh said.

De Groh explained that Teflon FEP's ability to reflect light and radiate heat are significantly better than other materials considered. The fabric-like strands in the scrim will retard crack growth and help keep the outer layer in place even when it becomes brittle. The new outer layer that astronauts will apply should last the life of the telescope—until 2010.

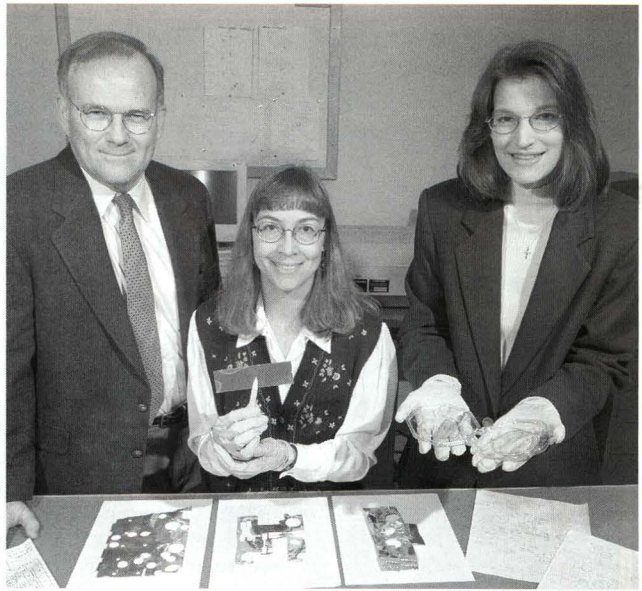


Photo by Tom Jares

Glenn's Hubble Space Telescope team (left to right)—Bruce Banks, Kim de Groh, and Joyce Dever—examine MLI samples retrieved from the first of two servicing missions and candidate replacement material.

During the third space walk when the astronauts repair the MLI equipment bays, they will return with the fresh samples of both the original MLI and MLI used to repair the blankets in 1987. Rearchers will then have samples with 3 and 3 1/2, 7 and 10 years of space exposure available for study.

"We're really looking forward to studying the returned samples," de Groh said. "It's very rare to be able to study materials that have been retrieved after being in the space environment for such a long time." ◆

A test of time and space

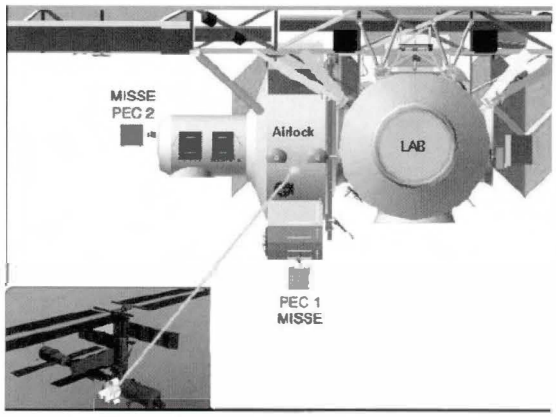
BY S. JENISE VERISa

MATERIAL for a sun shield to protect next generation telescopes may be among 700 samples tested in the Materials International Space Station Experiment (MISSE), a flight experiment designed to measure the stability and durability of materials and devices in the space environment.a

The first set of two suitcases carrying the samples is scheduled to launch August 2001 and be mounted outside the space station for a duration of 1a year. A second set of two suitcases, with a launch date to be determined, will be exposed to the space environment for 3 years.

Bruce Banks, chief of the Electro-Physics Branch and Glenn's MISSE project scientist, said that Glenn would be responsible for 158 MISSE samples.a

"We'll compare the rate of erosion on various materials tested ina ground-based facilities with in-space erosion with the goal of improving the prediction of the materials flight durability based on simulations produced by computer codes," Banks explained. "Pre- and post-flight data will be compared to determine the effects of atomic oxygen and solar radiation (ultraviolet and x-ray radiation) on different polymers and thin film coatings. Careful analysis of atomic oxygen undercutting will also be done to understand degradation processes and improve durability prediction accuracy."a



PEC's' (passive experiment carriers) transporting MISSE are to be the first payloads attached to the International Space Station.

Banks, along with Sharon Miller, Aaron Snyder, Kim de Groh, Joyce Dever, and Don Jaworske (principal investigators for the various Glenn samples) will be assisted by guest investigators from OAI, Cleveland State University, University of Toronto, Triton Systems, Inc., QSS Group, Inc., and Hathaway Brown School in Shaker Hts., Ohio.a

Students from Hathaway Brown were invited to participate in MISSE by de Groh as an extension of an earlier collaboration between the school anda Glenn's Electro-Physics Branch called the Polymer Erosion And Contamination Experiment (PEACE), a space shuttle Get Away Special canister experiment. The same 41 materials used in PEACE will be used on MISSE so that both short-term and long-term exposure tests will be available for those materials.a

MISSE is a cooperative effort sponsored by the Air Force Research Laboratory (Materials Lab) and NASA. ◆a

people on the mo

space act award

Glenn researchers merited a $40,000 NASA Space Act Award, one of the largest ever, for their development and transfer of coating technology that prolongs the life of space solar array blankets. The coatings are now protecting the solar array blankets on the International Space Station and were used on Russia's *Mir* Space Station solar arrays.

The award recognizes the inventive, problem-solving work of **Bruce Banks**, chief, and **Sharon Miller** of the Electro Physics Branch, along with **James Sovey**, On-Board Propulsion Branch, and **Michael Mirtich, Jr.**, NASA retiree and Analex consultant. The team developed the coating that protects blankets from the ravages of atomic oxygen, which causes unprotected blankets to deteriorate within a year.

Banks

Miller

Mirtich

Sovey

Dr. Woodrow Whitlow, director of Research and Technology, said that the cost savings to NASA in terms of repair and replacement missions is significant—in the millions of dollars.

Two Glenn innovations named 2002 most significant products

Glenn news release

Art restoration and computer simulation are not the kind of work readily associated with aerospace research, but at Glenn, such work is changing peoples' perceptions. This year, Glenn is the recipient of two prestigious *R&D 100* awards, which are presented annually by *R&D Magazine* for the year's 100 most technologically significant new products.

Atomic oxygen applied in art restoration and the Numerical Propulsion System Simulation (NPSS), a propulsion system simulation software program, are the Glenn winners for 2002. This brings Glenn's total to 85 since the award's inception.

NPSS, a world-class propulsion system simulation tool emerging as the U.S. standard for aerospace simulation, was built and maintained with the full interaction of every major U.S. aircraft engine manufacturer.

NPSS provides NASA and the U.S. aerospace industry with ease of use and a revolutionary engineering capability that will reduce cost and risk associated with advanced propulsion system development, translating into increased safety for aeronautics and the human exploration of space.

Cynthia Gutierrez Naiman, Glenn's NPSS team lead, worked with a team of 39, Glenn engineers and other organizations, including Analex, Cleveland; Arnold Engineering Development Center, Arnold Engineering Development Center, AFB, TN; The Boeing Company, Seattle, WA; General Electric Aircraft Engines, Cincinnati; Honeywell, Phoenix, AZ; Integral Systems Inc., Cleveland; Modern Technologies Corp., Middleburg Hts.; Pratt & Whitney, East Hartford, CT; Rolls Royce Co., Indianapolis, IN; RS Information Systems Inc., Cleveland; Teledyne Continental Motors Turbine Engines, Toledo; Williams International, Walled Lake, MI; Wright-Patterson Air Force Base, Dayton; and ZIN Technologies, Cleveland.

Removal of organic and carbon contaminants from the surfaces of paintings and other art objects by means of low-energy atomic oxygen is the second award-winning technology. This technology, developed to simulate the low-Earth-orbital space environment, has made it possible to etch as well as alter the surface chemistry and texture of many materials through atomic oxygen interaction processes. Commercial applications of this technology include medical and industrial and air restoration.

"We haven't even begun to realize all the potential applications for this technology," said Bruce Banks, Glenn's Electro-Physics Branch chief, who codeveloped the technique with Sharon Miller, a researcher in the same branch.

The 2002 *R&D 100* awards will be presented on October 16 during a banquet at Chicago's Navy Pier Convention Center.

Graphic by Terry Condrich

Tank 5: tops in electrical propulsion testing

A Glenn-developed 50-kW Hall thruster test program is underway in the Electric Propulsion Laboratory's Vacuum Facility-5 (VF5/Tank 5), and all systems are operating as expected. The facility's unique size and pumping speed allow researchers to validate hardware and technologies quickly simulated in the vacuum of space that may be key components in the Agency's future missions to Earth orbit and beyond.

An inside view of Tank 5, which is 4.6 m in diameter by 19.2 m in length. The chamber has a pumping speed in excess of 3,500,000 liters per second.

Significant ground test programs will be required to develop these thrusters operating at power levels exceeding 20 kW—an order of magnitude above the state of the art. Recent testing of the high-power NASA 457M Hall thruster achieved three times the power of any previous level in excess of 70 kW.

Located in Building 301, Tank 5 includes a number of isolated ports (up to 6 m in diameter) that allow multiple tests to be conducted without the need to cycle the entire facility to atmosphere. With over 100 kW of installed power for thruster testing, integral propellant feed systems, thrust stands, and plume diagnostics, Tank 5 provides the world's most-capable facility for high-power electric thruster and system testing.

Tank 5 was used to acceptance test ion engines and power processors (PPU) including the spaceflight engine and PPU that have successfully flown on the Deep Space 1 mission.

Glenn technology garners Space Act awards

Three Glenn-developed technologies were recently selected for Space Act Awards. Each honoree received a signed certificate from the NASA Administrator and a proportionate share of the $144,500 awarded to Glenn for FY02. The awards cover four areas, which include software release, publication and NASA Tech Briefs, Patent applications, and Board Action awards.

Hydroformed Ion Optics and Spall-Resistant Woven Screen Surfaces for Ion Thrusters technology developed by Bruce Banks, chief of the Electro-Physics Branch, prevents the formation of large flakes of metal generated by internal parts that could inhibit high-performance operation or shorten the life of a thruster.

A team from Glenn's Microgravity Environment and Telescience Branch developed the Microgravity Analysis Software System (MASS), which assures accurate and timely measurement of vibrations that might affect or threaten the outcome of microgravity research conducted on the space station. MASS was the runnerup for NASA Software of the Year. MASS team members include Kevin McPherson and Dr. Ted Wright (NASA), and Ken Hrovat, Eric Kelly, Gene Liberman, Nissim Lugasy, and Tim Reckart (ZINT).

Rafat Ansari, Microgravity Fluid Physics Branch, was recognized for his non-invasive diagnostic tool that can detect early changes in the eye associated with infection, allergic reactions, autoimmune diseases, glaucoma, cataracts, age-related macular degeneration, and diabetic retinopathy.

More information on NASA's Space Act Award Program is available at *http://icb.nasa.gov*. ◆

Dr. Ansari

Banks

Photo by Quentin Schwinn

MASS team members standing, left to right: Eric Kelly, Kevin McPherson, Gene Liberman, Ken Hrovat, and Nissim Lugasy. Sitting, left to right: Ted Wright and Tim Reckart.

R&D honor

Bruce Banks and **Sharon Miller**, Electro-Physics Branch, have received the *R&D 100* Editor's award for the Most Innovative New Product in 2002. This is an added acknowledgment of their research in Atomic Oxygen System Art Restoration, which earned an *R&D 100* award in 2002.

Banks

Miller

DECEMBER 2002

Awards & Honors

The Northeast Ohio Technology Coalition (NorTech), in conjunction with JumpStart, Inc., and their sponsors presented a 2004 NorTech Innovation Award to Glenn for the development of a technology that brings works of art back to life. Originally developed to simulate the low-Earth orbital space environment, this technology has made it possible to etch as well as alter the surface chemistry and texture of many materials with atomic oxygen, a low-energy beam of oxygen atoms. **Bruce Banks**, chief, Electro-Physics Branch, and **Sharon Miller**, senior research engineer in the Electro-Physics Branch, codeveloped a technique that applies this technology to successfully restore fire-damaged and defaced paintings that were previously considered beyond repair.

The Glenn chapter of the Business and Professional Women's (BPW) organization awarded its 2004 scholarships to the following Center employees who are currently

CONSERVATION CENTER

CONSERVATION CENTER INSTITUTE OF FINE ARTS NEW YORK UNIVERSITY

Academic Year 2000 - 2001

Monet's Waterlilies

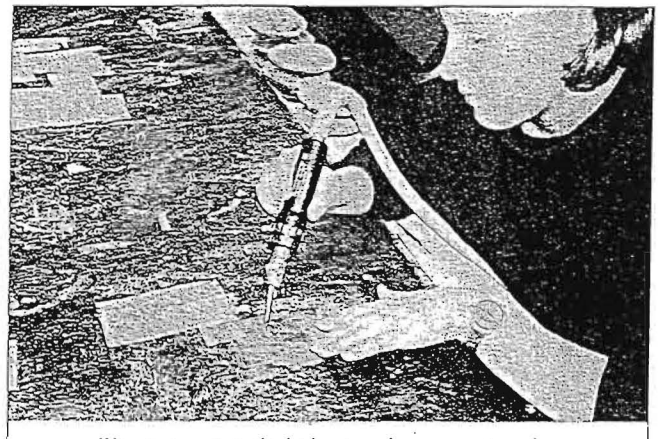
by Winstone Wells

One of the hottest topics of conversation this past year at the Conservation Center has revolved around the fire-damaged *Waterlilies* by Claude Monet that has resided in various storage areas of the Center for the past forty years.

This large, 79 x 71 inch canvas was donated to the Center in 1961. It was burnt in a fire at the Museum of Modern Art in 1958, and ever since it has been waiting for the development of a treatment that could revive its darkened and blistered surface. Meanwhile, it served as a study object for numerous students looking for pigment samples, cross sections, or trying out various cleaning tests. Now, at last, it has the potential to see better days in terms of its preservation – with the help of none other than NASA technology.

In the spring of 2000, Bruce Banks and Sharon Miller of NASA's Glenn Research Center in Cleveland, Ohio, visited the Conservation Center to give a presentation on a new process that could be used to remove soot and burnt materials, such as varnish and binding medium, from painted surfaces. They had initially presented this new treatment, which uses highly reactive atmospheric oxygen, at the 1998 AIC conference in Arlington, Virginia. I attended this talk and was quite excited about the possibilities this treatment offered, but had no idea that two years later I would be actively involved in applying this process to a Monet painting. After Sharon and Bruce explained the process and how it worked to our paintings class, we all proceeded upstairs to show them the Monet and determine whether there was any chance of success with the proposed oxygen treatment. The previous treatments they had performed had been on paintings that had heavy soot deposits that were impossible to remove with traditional methods. The Monet presented slightly different problems. Instead of removing loosely bound hydrocarbon soot, we were striving to remove the burnt varnish and medium from the upper surface of the paint layers. After the initial shock of the painting's present condition wore off, the scientists agreed the treatment had potential, and they were given three small samples of paint to run their tests on.

The treatment process involves placing the painting in a low-pressure chamber and exposing it to gaseous atomic oxygen. The individual oxygen atoms are highly reactive, combining easily with unattached or weakly bound atoms, such as those found in the hydrocarbon-containing layers of varnish and medium as well as surface grime and excess glue. Theoretically, as the carbon from these layers combines with the oxygen to form pigments particles will be unaffected. After monitoring the surface using a spectra-analyzer to determine the change in diffuse spectral radiance, the process would be stopped when the change in color no longer improves over time. The surface would be very fragile since the pigment particles would only be very loosely bound from behind, and a new binder would then be reintroduced.



Winnie is using slight heat and pressure to relax the cleaving and lifting ground back into place while consolidating the surface.

Hopefully, there will be a great change in the appearance of the painted surface, and other paintings once thought to be lost forever might finally be treated. At the end of September, Bruce and Sharon returned to present the results of their tests. They determined that after 200-250 hours of exposure to the atmospheric oxygen there was a substantial change in reflected color. Their presentation gave us great hope this would work for the Monet, and so it was decided we would move forward with this process. Of course, we do have many questions that need to be researched, but we expect to use this opportunity to test many things. So the past two semesters, I have taken on the *Waterlilies* as an independent project, preparing it for this treatment. I have spent many hours removing the facing tissues and consolidating the paint, and will soon finish stabilizing the canvas with mends and inserts for transportation. We hope we can schedule the treatment for early fall, with the treatment continuing over the next year or so with other paintings students. We are still in the early stage of this project, but we are eager to move forward with this experiment. Further updates will appear in Conservation Center Newsletter #12.

Date Distributed: November 20,2002

Current News of Note

FROM THE MEDIA RELATIONS OFFICE OF GLENN RESEARCH CENTER

BANKS

The Columbus Dispatch Online: Archival Article

11/19/2002

NASA BREATHES NEW LIFE INTO DAMAGED WORKS OF ART

Tuesday, November 19, 2002
NEWS - SCIENCE 06A

Illustration: Graphic, Photo

By Jane Hawes
For The Columbus Dispatch

CLEVELAND -- Bruce Banks doesn't strike you as an art buff.

The walls in his NASA office, for instance, are not adorned with pictures, prints or posters. Not even a museum calendar.

But propped on a stack of papers atop a filing cabinet near his desk is an oil painting.

Though the name of the woman in the painting has been lost to time, her weary face has been saved, thanks to space-age technology.

The 500-year-old artwork isn't worth much, but Banks can't seem to muster the will to throw it away. It serves as a reminder of a technology he helped develop that has proved a beautiful blend of art and science.

About eight years ago, Banks and fellow NASA research engineer Sharon Miller developed a procedure to mimic orbital conditions to test space-bound materials in the lab. The process, they later learned, can clean soot and other pollutants off oil paintings.

Like Tang, duct tape and other discoveries made in the name of the space program, this technology transcended the boundaries of science into the world of everyday applications.

Last month, Banks and Miller not only scored a coveted Research Development Magazine award for one of the top 100 new inventions of the year, but they also took home the prize for "Most Innovative New Product." In an award program widely regarded as the Academy Awards of the invention industry, the duo's honor was the equivalent of snatching the statue for Best Picture.

"It was a nice surprise," said Banks, who directs the electro-physics branch of the National Aeronautics and Space Administration Glenn Research Center near Cleveland.

But Banks is more eager to talk about what has become known as the patented "***atomic-oxygen*** art restoration" process itself than the accolades he has received for its development.

"It's really a spinoff of the original technology," Banks said. "And it's only been in the last 20-some years that we've developed it."

It all started with space travel to low-Earth orbit, or "LEO."

LEO is an atmospheric band about 100 miles to 400 miles above Earth, Banks said, where satellites and space stations orbit.

In order to test the materials that would be used for such travel, NASA scientists needed to simulate an environment in which oxygen is sparsely distributed and in single-atom form.

The air we breathe is laced with dual-atom molecules.

Along the way, Banks said, he and Miller saw that single-atom, or ***atomic***, ***oxygen***, is effective at removing "all forms of hydrocarbon, even ones that are real stubborn, like polyurethane" from the surfaces of inorganic materials.

It happens when single oxygen atoms latch onto carbon atoms, then float away in the form of carbon monoxide or carbon dioxide. If hydrogen is present, water vapor forms and also floats away.

Though simple in theory, the process to clean paintings, depending on the size of an artwork and the damage it received, requires either a $70,000 vacuum chamber or a $20,000 beam generator.

Still, no one thought about nonaerospace applications for ***atomic-oxygen*** until a couple of painting conservators from the Cleveland Museum of Art approached NASA.

The museum had some smoke-damaged, soot-coated paintings that resisted traditional restoration techniques, including the most common, cleaning solvents.

Museum officials ran out of ideas and called NASA Lewis, asking if it had anything that would help.

"I think they came to us out of desperation," Miller said.

"One (painting) was a very, very sorry 19th-century copy of an Italian Renaissance painting that had been damaged in a church fire," said conservator Kenneth Be.

The Madonna of the Chair, an oil painting from St. Albans Church in Cleveland, was almost completely blackened with soot, and some of the paint underneath had smeared when solvents were used.

NASA Glenn officials eventually decided to try ***atomic oxygen***.

"We try to spin off our technology to outside companies, basically to garner more support for NASA," said NASA spokeswoman Katherine Martin. "So many people say, 'Well, why are we wasting money on just space?'

"But it's not just for space."

Banks and Miller developed two ***atomic-oxygen*** machines to clean paintings. One is a large vacuum chamber for flat items up to 4 feet by 6 feet. Inside, the process can take as long as 350 hours. The other is a small beam generator used for spot-cleaning. Results are almost instantaneous.

NASA used the vacuum chamber on St. Albans' Madonna and the results were stunning.

"The beauty of their technique is that it's a noncontact approach," Be said. "But it's so different, not being able to see it as (the cleaning occurs). It was a little unsettling."

The Andy Warhol Museum in Pittsburgh called after a visitor kissed a painting and left a lipstick smudge on the canvas. Because the artist hadn't protected the surface with varnish, solvents would cause the lipstick to soak further into the canvas.

A slow treatment with ***atomic oxygen***, however, removed all traces of the kiss.

There are other applications.

For example, a St. Louis police officer is optimistic about using ***atomic oxygen*** to determine whether bank checks have been altered.

Officer Lynda Taylor-Hartwick read about ***atomic oxygen*** in a science publication last year and contacted Banks.

"There's not a smooth, continuous flow of ink when a document's been altered," Taylor-Hartwick explained. "With this ***atomic-oxygen*** apparatus, you can tell where the newer ink has been added."

Banks said he's learned a lot about forgery: "When a (numeral) 1 has been changed to a 9, then there's a double thickness where the new ink crosses the 1's vertical line. The ***atomic oxygen*** etches away that top layer (of ink) so you can see that it was a double layer."

The NASA duo also have used ***atomic oxygen*** to build a better petri dish, etching the dish's plastic interior to create a surface that allows fluids to spread out better. The same surface-etching capabilities have been used to improve the material that expands tissue during plastic and reconstructive surgery.

"When the surface is rough, that means it has certain desirable properties with regard to tissue," Banks said. "It's less likely to reject them."

He and Miller also are finding they can sterilize surgical implants, such as artificial joints, better because exposing the materials to ***atomic oxygen*** lifts away contaminating cell residue better than traditional radiation.

Just about the only application that hasn't worked is using ***atomic*** oxygen to create better mailing labels. Although etching the paper does create a surface that accepts ink better, "it's just not cost-effective," Miller said.

Banks estimated that NASA charges anywhere from "a few hundred dollars to about $20,000" per job, depending on the complexity.

"It's easy to make things better," Banks said, "but it's not as easy to make things better and cost-effective."

The painting Banks keeps in his office, the one of the old woman he calls "Grandma," actually is one of his failures.

Her smoke-damaged surface couldn't be cleaned to museum-quality standards, so the private collector who owned the painting told Banks he could toss the 16th-century portrait into the trash.

"I didn't have the heart to throw it out," Banks said with a smile.

JaneEHawes@cs.com

Caption: (1) GRAPHIC
(2) PHOTO
(3) The serene beauty of
St. Albans Church's painting
Mary Magdalene, covered with years
of soot and grime, shines through at right after being cleaned using the atomic-oxygen process developed at the NASA Glenn Research Center.
(4) ERIC ALBRECHT | DISPATCH
NASA research engineers Sharon Miller, left, and Bruce Banks use a 500-year-old oil painting to show the before and after effects of cleaning by the atomic-oxygen process.

Date Distributed: June 27, 2003

Current News of Note

FROM THE MEDIA RELATIONS OFFICE OF GLENN RESEARCH CENTER

Banks, Bruce

The Plain Dealer | Thursday, June 26, 2003

Big business in small tech

WINN L. ROSCH
Special to the Plain Dealer

Nanotechnology is a key technology that makes downsizing possible, in part because it is downsizing taken to the extreme.

Dealing with things measured in billionths of a meter — nanotechnology — reduces bulk materials to mere clusters of atoms. Add nanotechnological materials to today's plastics, for example, and they become both lighter and stronger.

Ron Clark is president of the trade group Ohio Polymer Enterprise Development in Akron, one of several groups in the state hoping to help businesses here capitalize on the new technology.

He knows such small stuff can be big business. Ohio's economy stands to gain billions from exploiting nanotechnology. It may be the key to the state's industrial future, at least if it moves from laboratory to business.

And for some, that's the rub. Although Ohio is a hot spot in the development of nanotechnology, the climate here for bringing it to market is so cold it's putting the freeze on business development.

Promising as it is, nanotechnology often takes a back seat to MEMS, Micro Electro-Mechanical Systems, in popular imagination. MEMS means everyday machines shrunk to a scale that makes a hair larger than a giant sequoia. It promises miniature robots smaller than dust motes that someday will do our work. *En masse*, MEMS will manufacture goods to high precision or slip inside your bloodstream to carve away cholesterol.

But while MEMS remains the stuff of laboratory and science fiction, nanotechnology is already going to work. For example, Nanofilm Ltd. in Valley View this year celebrates its 18th anniversary.

Compared with MEMS, nanotechnology means stuff that's smaller still, a thousandfold smaller, pushing the scale down so far that the moon would shrink to the size of a pea. At that scale, the world changes dramatically. Ordinary materials act strangely.

If you get things small enough, they melt at different temperatures — usually lower — have different optical effects, electrical effects and magnetic effects,said William W. Gerberich, professor of chemical engineering and material science at the Institute of Technology of the University of Minnesota.

Some materials become harder — nanoparticles of silicon become nearly as hard as diamonds. Catalysts become more active. Electrical circuits develop strange behaviors.

Nanotechnology exploits these effects to create new materials and products. For example, adding nanoparticles of clay to some plastics raises their melting temperatures enough to make possible plastic intake manifolds for automobile engines. Nanothin coatings dramatically alter the performance of optics.

"My business is to take inexpensive things, coat them with something you cannot see and make them valuable," explained Scott Rickert, president and CEO of Nanofilm, which layers optics with coatings one molecule thick at a time.

Nanotechnology has found four major application areas in industry — in electronics, basic materials, medical applications and tools.

Of these, nanoscale particles embedded in polymers hold promise of the most immediate economic benefits for Ohio businesses, tying into industries where the state is already strong. Ohioranks among the top five in the plastic/polymer industry and is No. 1 in some areas.

"The total market for just mixing stuff — that is, taking a resin from Dow or DuPont and mixing in color or other components — is almost $9 billion in the U.S., and Ohio has the biggest chunk of that, about a quarter," said Robert Monter, senior technology specialist for the Wright Technology Network in Dayton.

Nanomaterials have already found their way into commercial polymer products. "A number of different materials are starting to be used by the plastics industry," Monter continued. "Compounders and those who manufacture plastic parts are incorporating nanomaterials for a variety of reasons — to improve the temperature at which plastics can be used, to

"Incorporating nanotechnology in new products is key to maintaining our position in the economy."

Ron Clark, *president of the Ohio Polymer Enterprise Development*

add flame retardancy, to improve physical properties such as tensile strength and modulus, even to increase the oxidation resistance of the material."

To stay competitive in today's tough international market, the Ohio polymer industry must aggressively embrace nanotechnology, Clark believes.

"Incorporating nanotechnology in new products is key to maintaining our position in the economy," he said. "Commodity plastics are moving overseas fast. To replace that we've got to move into more advanced materials to produce composites they cannot."

On a more practical level, polymer companies need to take advantage of nanotechnology to satisfy the needs of their customers.

"Ohio's plastics companies are very much entwined with the auto industry," Monter said. Because the auto industry continues to substitute plastic for metal to reduce weight and improve fuel efficiencies, the industry continues to look for improvement in the performance of plastic materials.

Other applications for nanotechnology and nanomaterials that involve other Ohio industries loom.

For example, adding a tiny percentage of carbon nanotubes to a plastic can make it conductive, an effect the Air Force is studying for use in battery electrodes.

Nanoparticles also hold promise for the petroleum industry. You can put them in fuels to make them burn cleaner and more efficiently, Monter said.

Nanomaterials are also key to making fuel cells practical, Clark said.

Ohio is a major player in developing these technologies. Several universities in the state have research programs in nanotechnology (as well as MEMS). These include Case Western Reserve University, Kent State University, Ohio State University, the University of Akron and the University of Cincinnati.

In addition, Ohio hosts two large federal research facilities actively working on nanotechnology — NASA's Glenn Research Center, where Dr. Bruce Banks is testing a nano-texture surface treatment that could help spacecraft get rid of excess heat. Also, there's the Air Force Research Laboratory at Wright-Patterson Air Force Base in Dayton.

Exploiting this research is another matter entirely. Commercializing any new product or technology requires investment capital, and that's where the nanotechnology community sees Ohio failing.

"The venture capital market in Ohio is not good, and that holds business back from being able to progress rapidly in what is a highly competitive area," observed Jim Mazzella, CEO of Five Star Technologies Inc. in Cleveland.

"The attitude of local venture capitalists seems to be once burned, forever shy," said Dave Lupyan, director of business development for Nanofilm, who believes that investors haven't recovered from the technology industry crash.

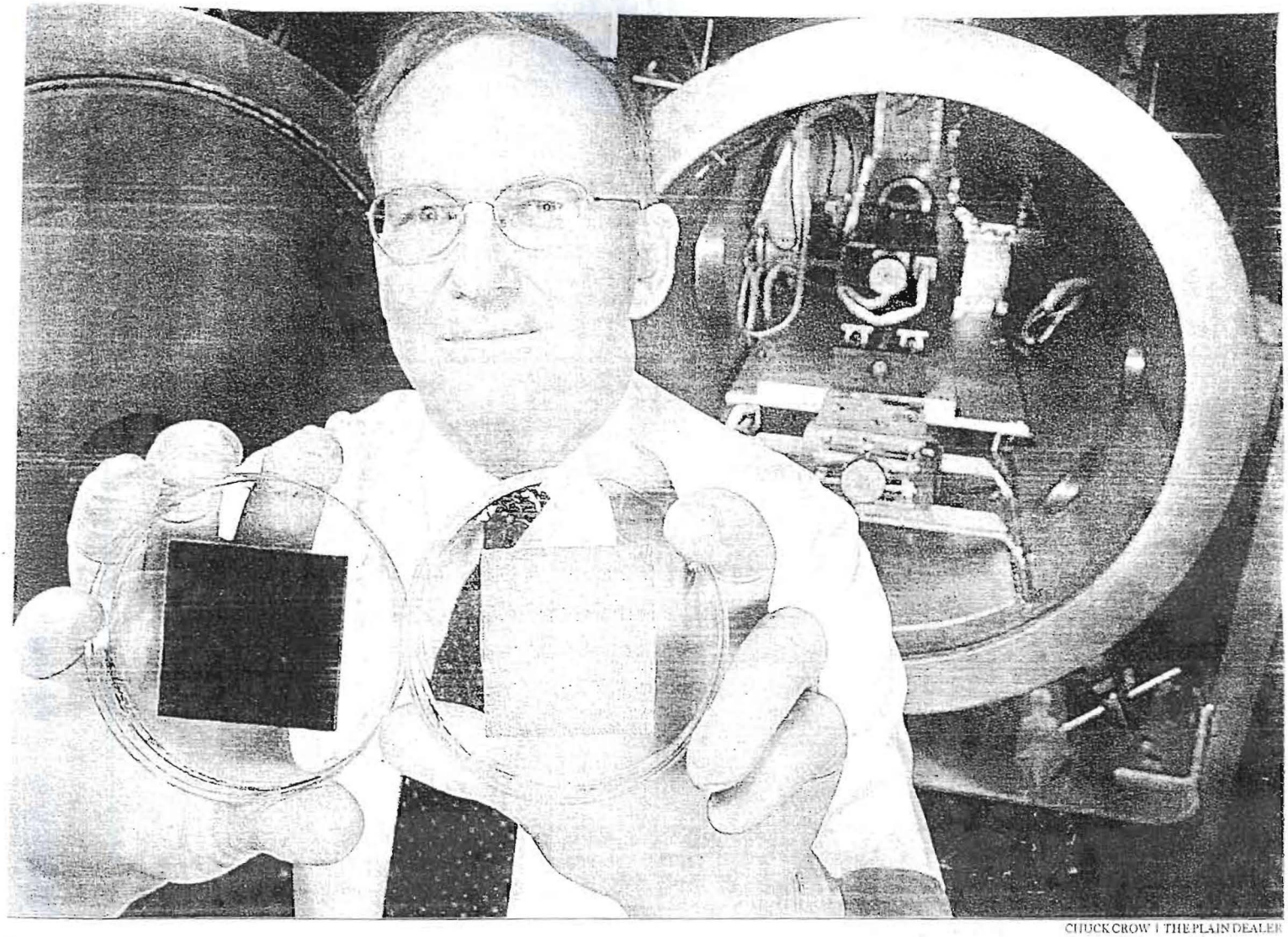
Government money has helped. Many nanotechnology companies depend on the Small Business Innovation Research program run by the Department of Defense. But for some, that's not enough.

"There hasn't been enough government money going into it for commercialization to have a significant impact," Mazzella said. "While the state has done good work in supporting the technology, those things don't take the place of the much larger venture dollars needed to commercialize technologies in a big way."

There's more at stake than a few new products, however. Nanotechnology, many believe, will be *the next big thing*. It holds the potential for changing, if not the world, all of modern industry.

"Nanotechnology is going to be an amazing revolution in everything," Rickert said. "Whenever you have a change in material science, it has far more impact than a change in a device. Plastics and silicon wafer fabrication fundamentally changed material science. I just think that it is a guarantee of what will happen with nanotechnology."

Rosch is a Shaker Heights free-lance writer.



CHUCK CROW | THE PLAIN DEALER

)r. Bruce Banks of the NASA Glenn Research Center holds, at left, a nano-textured surface he created. In his other hand is the graphite surface before treatment. The extured surface could help spacecraft lose excess heat. Behind Banks is an atomic oxygen beam facility that simulates the atmosphere of low earth orbit.

Glenn rewards Banks for counterintelligence awareness

The Security Management and Safeguards Office (SMSO) recently presented Bruce Banks, chief of Glenn's Electro-Physics Branch, with the first NASA Counterintelligence (CI) Program award. The award recognizes sustained commitment to protecting the security interests of NASA and the United States.

This award recognizes an individual the SMSO feels consistently supports the CI objectives and missions, reports potential foreign technology collection, and integrates counterintelligence principals into their daily work effort. A plaque, which accompanies the award, will be rotated throughout the Center every 6 months.

"It is through the involvement and efforts of employees like Bruce Banks that help ensure the protection of essential U.S. technologies," said Charles Scales, Director of Center Operations.

The NASA CI Program was officially ratified February 27, 2002, with the signing of NPD 1660.1, NASA Counterintelligence Policy. The program was designed for the propose of detecting, deterring, and neutralizing threats to NASA personnel, facilities, programs and projects by Foreign Intelligence Services, other foreign entities, and domestic or international terrorists.

The SMSO oversees the CI program at each NASA center with the objective of creating awareness and interacting with NASA programs and their representatives to recognize and report suspected foreign intelligence collection activities.

"CI integration strengthens the overall security program by promoting early identification and referral of cases involving possible espionage," explained David Malcom, SMSO special agent/ counterintelligence at Glenn. "CI involvement also enhances security applications in terms of targeting and methods of operation. The success of a center's CI Program heavily depends on the involvement and reporting by its employees."

Glenn has integrated counterintelligence principles and the use of classified foreign-collection threat information to improve the activities within programs to include risk management, threat awareness, illegal technology transfers, and preventing espionage. Based on Glenn employees reporting of suspicious activity, the SMSO is able to build upon previously observed trends of collection interest and activity by foreign companies and governments against the Agency.

In the last year the SMSO has made a concerted effort to facilitate employee reporting and involvement. Employees can now report suspicious activity by using the following e-mail address safeguards@grc.nasa.gov. ◆

C-2004-0000 Photo by Michelle Murphy

Center Director Julian Earls congratulates Banks on receiving the first CI Program award.

National Aeronautics and Space Administration

John H. Glenn Research Center
Lewis Field
21000 Brookpark Road
Cleveland, Ohio 44135

Volume 6 Issue 12 December 2004

NASA Glenn Research Center AeroSpace Frontiers

AeroSpace Frontiers is recyclable!

Glenn earns 10 Space Act Awards

Ten Glenn-developed technologies were recently selected to receive 2005 NASA Space Act Awards by the NASA Inventions and Contributions Board. Space Act Awards are monetary awards for outstanding scientific or technical contributions sponsored, adopted, supported, or used by NASA that are significant to aeronautics and space activities.

Engine airframe structural system analysis tools
Dr. Charles Lawrence and Dr. Kelly Carney, Structures Division

Fully suspended five axis three-magnetic bearing dynamic spin rig with forced excitation
Carlos Morrison, Andrew Provenza, Dr. Anatole Kurkov, Gerald Montague (U.S. Army), Dr. Kirsten Duffy (UNIT), Oral Mehmed, Dr. Dexter Johnson, and Ralph Jansen (UNIT), Structures Division

COBRA–AHS rolling element bearing design software
J. Poplawski, H. Galatis, S.M. Peters, J.H. Rumbarger, and R. Flower, J.V. Poplawski & Associates

Developing a method of hydroforming dish grids and making spall-resistant anodes for ion thrusters
Bruce Banks, Power and Electrical Propulsion Division

Turbomachinery analysis software
Dr. Roderick Chima and Dr. Meng-Sing Liou, Propulsion Systems Division

Time-Accurate Quias-One Dimensional Reactive Code for Design and Analysis of Gasdynamic-Based Propulsion Systems
Dr. Daniel Paxson, Instrumentation and Controls Division

Software for system controlling a magnetically levitated rotor
Carlos Morrison, Structures Division

Thermal barrier and solid rocket motor joint design
Dr. Bruce Steinetz and Pat Dunlap, Structures Division

Spreadsheet for tracking an evaporating droplet for multiple fuels
Dr. Cecil John Marek, Propulsion Systems Division, and Dr. Ka Heng Liew, Egel Urip, and Song-Lin Yang, Michigan Technological University

Antenna near-field probe station scanner
Dr. Felix Miranda, Dr. Afroz Zaman, Dr. Richard Lee, Philip Barr, and Kevin Lambert (ANLX), Communications Division; and William Darby, Research Testing Division ◆

iTA helps remove any doubt

BY S. JENISE VERIS

Photo by S. Jenise Veris

Glenn Technical Warrant Holders Rohn, Jankovsky, and Shaltens. Not pictured is Banks, a recent selectee.

NASA has taken a significant step toward ensuring safe and reliable operation of future shuttle missions by establishing a position within the Agency known as the Independent Technical Authority (iTA). The iTA is structured so that those who have responsibility for the operations of high-risk technologies have an equal voice in the process of determining technical and safety readiness.

As the iTA, NASA's Chief Engineer Rex Geveden leads the Agency's challenge of renewing a technical conscience independent of program schedules or costs. Last year, former Administrator Sean O'Keefe implemented the iTA as part of the Agency's Transformation following the recommendations of the Columbia Accident Investigation Board and the Presidential Commission on Implementation of U.S. Space Exploration Policy.

Geveden has sole waiver-granting authority for establishing, approving, and maintaining technical standards across the Agency. He has developed a technical warrant system to execute a robust iTA formal process that delegates technical authority to competent individuals at NASA field centers. Forty-two technical warrant holders across the Agency conduct and oversee high-risk technical work on a daily basis in order to ensure safe and reliable operations and missions. A warrant holder can be either assigned for a technical discipline or for the system integration of a total vehicle or program system.

Following a visit to Glenn in March, Geveden chose three technical warrant holders: Robert Jankovsky, Electric Propulsion Branch chief, holds a discipline warrant for electric propulsion; Dennis Rohn, Systems Engineering and Integration Branch, holds a systems warrant for Fluids and Combustion; and Richard Shaltens, Thermal Energy Conversion Branch chief, holds a discipline warrant for Nuclear Systems and Power Generation. More recently, Bruce Banks, Electro-Physics Branch chief, was selected a discipline warrant holder for Induced Environments—Chemical.

In order for warrant holders to fulfill their daily responsibilities, Center Director Dr. Julian Earls has authorized Glenn's Chief Engineer Jose Vega to manage the negotiations and documentation of iTA requirements by procuring trusted agents (TAs) who will provide support to Agency warrant holders. TAs act as the "eyes and ears" of a warrant holder. By suggesting technical assignments and training programs to ensure the technical skills of staff in the warrant holders' area remain current, TAs assist, when requested, in discharging a warrant's responsibilities. To date, 15 Glenn employees have been appointed TAs—half of which support warrant holders at other centers. They include:

- TAs for Glenn: Mike Patterson, Dave Manzela, George Soulas, Luis Pinero, Lee Mason, Mike Barrett, Jeff Schreiber, and Rick Wiedenmannott
- TAs for Langley: Dr. Damodar Ambur, Dr. John Gyekenyesi, Dr. Pappu Murthy, and Dr. Timothy Gabb
- TA for Johnson: James Yuko
- TA for Marshall: William Schoren
- TA for Stennis: James Zakany

"The iTA represents a cultural transformation in technical decisionmaking across the Agency," Vega said. "Identifying the technical warrant holders and TAs makes the technical community more aware that there is a process in place that will elevate an unresolved technical concern, exhausting normal channels, so that it reaches the highest level."

Vega plans to conduct dialogue sessions with all technical organizations at Glenn to increase employee awareness of the iTA process. Look for updates about iTA in NASA's *ASK Magazine* as well as training modules and workshops for technical warrant holders and TAs on *Today@Glenn*. ◆

2006 HONOR AWARDS

Forty-Year Service Awards

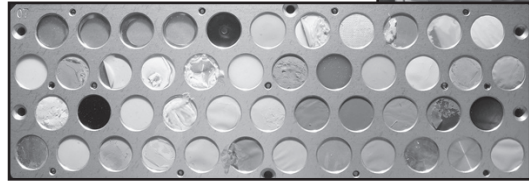
Bruce A. Banks, Electro-Physics Branch
William K. Coho, Diagnostic and Data Systems Branch
James L. Dolce, Advanced Electrical Systems Branch
Dr. Julian M. Earls (Retired 01/02/06), Office of the Director
Dr. David P. Fleming, Systems Management Branch
Ernest R. Flower, Jr., Operations Management Branch
Robert J. Freedman, Facility Management and Planning Office
John B. Haggard, Jr., Mission Operations and Integration Projects Office
Pamela Kotlenz, CIO Policy and Planning Office
Hugh M. McLaughlin, Logistics and Technical Information Division
John A. Mihevic, Systems Management Branch
Dr. Stephen V. Pepper, Tribology and Surface Science Branch
John P. Riehl, Space Propulsion and Mission Analysis Office
Richard C. Spangle, Aviation Environments Technical Branch
Vincent J. Scullin, Experimental Data Software Branch
Charles M. Spuckler, Ceramics Branch
Adele C. Szuhai, Space Systems and Grants Branch
Sherrill K. White, Security Management and Safeguards Office

Editor's Note: *Recipients of other awards recognized at the ceremony were published previously in the* AeroSpace Frontiers. *They include Senior Executive Service Appointment, Presidential Rank Awards and Procurement Supervisor of the Year Award.*

International Space Station materials return to Earth

Photo by Doreen Zudell

Right: Researchers de Groh, left, and Banks, far right, are assisted by students Lauren Berger and Rochelle Rucker as they open the polymer samples in a clean room at Glenn. Below: PEACE samples after 4 years of exposure.



Glenn researchers and students recently received an important package that they have been anxiously awaiting for more than 4 years.

On November 14, members of the Electro-Physics Branch and students from Hathaway Brown School opened the Polymer Erosion and Contamination Experiment (PEACE).

Part of the Materials International Space Station Experiment (MISSE), PEACE was attached to the outside of the International Space Station after launching aboard STS–105 in August 2001. Originally planned to be retrieved in 2003 after 1 ½ years of exposure, the experiment was retrieved during the STS–114 Return to Flight mission after 4 years of space exposure.

Now that the polymer samples are back, Glenn researchers will analyze them to determine how well they withstood the harsh environment of space. So far, PEACE principal investigator Kim de Groh is happy with what she has seen.

"The samples look very interesting," she said. "A few were completely eroded away, many are degraded in varying degrees, and several still have a pristine appearance. So we have a wide range of degradation results to analyze."

In 2001, four Hathaway Brown high school students helped de Groh prepare the samples for flight. Those students have since graduated and passed the torch to a younger team. They will assist de Groh and co-investigator Bruce Banks by conducting numerous analyses of the samples.

Polymers are long-chain molecular materials often used for spacecraft applications because of their light weight and flexibility. Data from this long-duration space experiment is quite unique, according to de Groh, and will provide valuable information for spacecraft design purposes. ◆

This article was written by Jan Wittry, SGTI/Community and Media Relations.

Honor Awards

Continued from page 1

Kevin P. Coleman
For exceptional service in records, forms and history program development and management.

Joyce A. Dever
For exceptional service in providing technical excellence and fostering effective collaborations vital to mission success.

Gene Fujikawa
For outstanding technical and management leadership in digital communications for advancing space missions.

Frank J. Greco
For sustained leadership in advancing the Agency's safety and mission assurance engineering discipline.

Michael A. Heryak
For exceptional contributions and success in developing customer-focused networking and communications services for NASA.

Dale A. Hopkins
For exemplary leadership in providing breakthrough technologies for jet engine fan cases/containment systems and engine "blade-out" failure event simulation.

Avis V. Hudson
For knowledge, dedication and outstanding leadership skills that have significantly contributed to GRC's visibility in local, regional, and national outreach efforts.

James E. Hunter
For significant and sustained impact to many important NASA programs.

Dr. Felix A. Miranda
For outstanding technical and managerial leadership in Antenna and Microwave Technologies for Space Communication.

Dr. Elizabeth J. Opila
For outstanding accomplishments in the area of high-temperature degradation and durability of advanced ceramic material and its successful impact on aeronautics and space efforts.

Timothy C. Pierce
For dedicated service, technical skills and judgment in providing excellent procurement services to NASA programs and the Glenn Research Center.

David A. Sagerser
For significant and sustained performance within NASA's Advanced Aircraft Program and exceptional ingenuity in building successful collaborative relationships with the Department of Defense.

Kathleen E. Schubert
For exceptional abilities and accomplishments in integrating flight project activities at Glenn Research Center.

Tony D. Shook
For sustained engineering excellence and exceptional contributions to GRC's in-house turbine engine noise-reduction projects.

Dr. David L. Urban
For outstanding technical and managerial leadership that has enabled significant enhancements to combustion science and fire safety in microgravity environments.

Lynne M. Wiersma
For many years of exceptional support to the Center's program and project organizations.

Dr. Mary V. Zeller
For outstanding technical and outreach excellence as a successful manager and steward for the Agency.

Exceptional Administrative Achievement Medals

Myrtle L. Collins
For outstanding administrative support of the Office of the Director and NASA Glenn Research Center.

Linda Srneck
For dedication and excellence in providing secretarial support to the engineers and support personnel.

Outstanding Leadership Medals

Bruce A. Banks
For outstanding leadership and exemplary service to NASA and its customers.

Mary C. Lester
For outstanding leadership in all areas of the Logistics and Technical Information Division activities and in support of the Center's focus on safety.

Equal Employment Opportunity Medals

Dr. Jih-Fen Lei
For exemplary commitment to and support of NASA Glenn Research Center's equal opportunity programs and goals through mentoring, coaching and advocacy.

Frank Robinson
For exemplary commitment to and support of NASA Glenn Research Center's equal opportunity programs and goals.

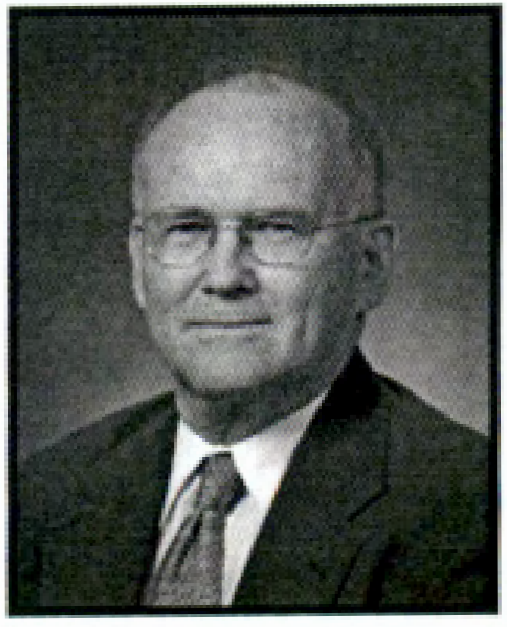
Group Achievement Awards

The following awards represent the outstanding performance of team alliance uniting Glenn personnel with those from other NASA centers, government agencies, industry, and academia to develop products and

Continued on page 3

Retirements

Bruce Banks, Space Environmental Durability Branch, retired on August 3, 2007, with 43 years of federal service, including 41 with NASA.



Banks

Betty Jane Waszil, Logistics and Technical Information Division, retired on July 3, 2007, with 43 years of federal service, including 41 with NASA.

Banks Awarded Patent

Banks

The U.S. patent entitled "Energetic Atomic and Ionic Oxygen Textured Optical Surfaces for Blood Glucose Monitoring," was awarded to **Bruce Banks**, ALPHA/Space Environmental Durability Branch. The patent focuses on a process for developing a fiber optic glucose measurement technique that measures human blood samples that can be much smaller than those examined through conventional glucose measurement. Questar Medical, Inc., Minneapolis, Minn., has been developing the instrumentation for commercializing this new technique with Glenn, through reimbursable space act agreements. The textured, fiber optic blood glucose monitoring devices for diabetic applications allow blood sampling to be taken from low-sensitivity body locations rather than the conventional pricking of finger tips.

February 2008

Pec

Seven Glenn employees were selected as Space Flight Awareness (SFA) honorees and invited to attend STS-119 launch festivities at NASA Kennedy Space Center as reward for their contributions to NASA's Human Space Flight Programs. The STS–119/ Discovery mission duration was March 15 to March 28.

The SFA Award, coordinated by NASA Johnson's Office of Space Flight, is one of the most prestigious awards available to employees of NASA, industry, space shuttle and International Space Station teams. The following Glenn employees' contributions were recognized:

David Carek, Systems Engineering & Analysis Division, for dedicated support as Glenn's Lead Systems Engineer of the Extravehicular Activity (EVA) Power, Avionics and Software team, and for requirements definition and early exposure of Constellation Program software risks.

Trudy Kortes, Service Module Project Office, for leadership in the vehicle development process and in critical areas supporting the fundamental elements of safe and successful spaceflight as the Project Orion Service Module Test and Verification manager.

Sharon Miller and NASA retiree **Bruce Banks**, Alphaport/Space Processes and Experiments Division, for predicting the durability of the multilayer insulation blanket on the Hubble Space Telescope (HST). They used a combination of advanced space flight- and ground-based testing and analysis to reduce physical risk to astronauts as well as significant costs by eliminating a difficult EVA from a HST servicing mission.

Monica Palivoda and **Lynne Wiersma**, executive support assistants for the Space Flight Systems Directorate, for commitment, enthusiasm and excellence in managing the Space Flight Awareness Program at NASA Glenn.

Glenn Earns Eleven Space Acts

Continued from page 1

Photo by Marvin Smith 2007-2513

Dr. Okojie working with silicon wafer in Glenn's clean room.

•Atomic Oxygen Textured Surfaces for Blood Glucose Monitoring Relating to Control of Diabetes. Bruce Banks (ALPH), Space Environment & Experiments Branch, is the recipient of an ICB Exceptional Award for the second year in a row.

•Optical Actuation Technology developed by Dr. Grigory Adamovsky, Communications, Instrumentation and Controls Division, Sergey Sarkisov, SS Optical; and Michael Curley, Alabama A&M University.

Banks

•Cellular Reflect Array Antenna developed by Dr. Robert Romanofsky, Communications, Instrumentation and Controls Division

To learn more about these innovations or to apply for Space Act Awards, contact Laurie Stauber, Glenn's awards liaison officer, Technology Transfer & Partnership Office, at 216–433–2820.

—BY S. JENISE VERIS and LAURIE STAUBER

People

Banks

Miller

Waters

Bruce Banks (ALPH), **Sharon Miller** and **Deborah Waters** (ASRC) in the Space Environment & Experiments Branch are the recipients of the 2009 Federal Laboratory Consortium (FLC) Award of Excellence in Technology Transfer, which was presented at the FLC National Meeting, May 7. The award honors laboratory employees (and their commercial partners) for outstanding achievement in advancing the mission of transferring federally developed technology to the marketplace. The Glenn team is honored for their work in Atomic Oxygen-Textured Surfaces for Blood Glucose Monitoring. *For nominations to the FLC and other NASA technology awards and incentives, contact Laurie Stauber, Technology Transfer & Partnership Office.*

Polymers Experiments Yield Valuable Data

Photo by Doreen B. Zudell

Researchers and students examine PEACE materials flown outside the ISS. Pictured, left to right:Aobo Guo, Claire Ashmead, Karen Inoshita and Arielle Stambler with Glenn researchers Bruce Banks and Kim de Grob.

This past November, members of the Space Environment and Experiments Branch and local students received a special delivery from the International Space Station (ISS).

The package was Glenn's Stressed Polymer Erosion and Contamination Experiment (PEACE) Polymers experiment, flown as part of the Materials International Space Station Experiment 6 (MISSE 6). MISSE is a series of flight experiments that are mounted on the exterior of the ISS, exposing thousands of material samples and devices to the space environment. MISSE 6 included both active and passive experiments. When retrieved from space, researchers test the samples, such as the passive samples in Stressed PEACE Polymers experiment, for their long-term durability in the harsh environment of space.

PEACE is a collaboration between students at Hathaway Brown School for girls in Shaker Heights and Glenn researchers that began in 1998 and has continued through the years. Through the collaboration, students have been able to perform research in a professional environment, attend international conferences and co-author technical papers. In addition, the students have entered their NASA research in prestigious national and international science fairs and have won scholarships and awards. Students will now analyze the latest retrieved samples to determine how well they withstood the space environment.

Data derived from the Glenn-Hathaway Brown collaboration has proven to be a valuable resource in the field of spacecraft materials in and outside of NASA.

—BY DOREEN B. ZUDELL

Professional Honors Presented

Banks

The SAE International Association presented the 2010 Clarence "Kelly" Johnson Aerospace Vehicle Design and Development Award, in October, to **Bruce Banks**, a NASA retiree and current Alphaport senior physicist who supports the Space Processes and Experiments Division. Named for Johnson, the founder of Lockheed's Skunk Works, the award honors significant contributions to the innovative design and development of advanced aircraft and/or spacecraft. Banks was selected for development of atomic oxygen durable solar array blankets used for the International Space Station estimated to have saved $15 billion in repairs, and the hydroformed ion optics and spall-resistant surfaces that enabled ion thrusters to operate on the Deep Space One and Dawn missions.

de Groh

The Society of Women Engineers (SWE) presented the Judith Resnik Challenger Medal to **Kim de Groh**, a senior materials research engineer in Glenn's Space Processes and Experiments Division, in October. Named for SWE member and astronaut, Dr. Resnik, the award is reserved for specific engineering breakthrough or achievement that has expanded the horizons of space exploration. deGroh was selected for exceptional materials performance expertise and for playing a crucial role in the success of the Hubble Space Telescope mission.